# Drivers of innovation in the agro-food micro, small and medium enterprises of Uganda

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## Abstract

**Purpose** – With focus on Uganda, this study assessed the factors influencing agro-food micro, small and medium enterprises (MSME) innovations. Kampala, Wakiso, Mukono and Jinja districts were the locations of the research.

**Design/methodology/approach** – Primary cross-sectional data was collected using structured questionnaire for a sample of 521 agro-food MSMEs in Uganda. Descriptive statistics, exploratory factor analysis and hierarchical regression analysis were used to examine the data in SPSS.

**Findings** – The findings indicate that MSME innovation levels were usually high, at roughly 80%. The presence of rules that encourage innovation and reward creative people would enhance innovation that is customer-focused. On the other hand, policies and principles that encourage innovation and the conduct of internal product and process improvement research would promote system-focused innovation.

**Research limitations/implications** – Encouraging agro-food MSMEs to develop policies that support innovation would improve the overall level of innovation, while building the capacity of agro-food MSMEs to conduct product and process improvement research would increase the level of systems-focused research.

**Originality/value** – This study assessed the drivers of innovation in agri-food MSMEs in a developing country. The uniqueness of this study is in assessing the effects of innovation support services on customer-focused and systems-focused innovations.

**Keywords** Agri-food sector, Customer-focused innovation, System-focused innovation, Innovation policy, Employee reward, Uganda

**Paper type** Research paper

## 1. Introduction

Micro, small and medium enterprises (MSMEs) in developing countries are important for provision of employment and are as well significant contributors of Gross Domestic Product (GDP) and domestic tax in these countries. According to Muriithi (2017), MSME contribution to GDP in sub-Saharan African (SSA) countries varies from as low as 8% in Zambia to 70% in Ghana, while contribution to employment ranges from 14% in Zimbabwe to 90% in Ethiopia. In Uganda, MSMEs contribute over 20% of GDP and 94% of all formal employment (Muriithi (2017)). A report by the International Finance Cooperation (IFC) reveals that there are over 1.1 million MSMEs in Uganda (IFC, 2021). Although SMEs are found in almost all sectors of the

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Uganda economy, agro-based SMEs tend to be more important given the agrarian nature of the economy. Over 75% of the population work directly in agriculture, with the sector contributing more than 20% of the GDP (World Bank, 2021).

Agro-based MSMEs support smallholder farmers by providing them with market for their produce, and in some cases providing agricultural extension services and input support (Ba *et al.*, 2019; Manogna, 2021). MSME growth is therefore important in sustaining the livelihoods of millions of people. Such growth and expansion of MSME leads to increased levels of employment, increased market for the smallholder farmers, increased GDP and consequently the government tax base (Chege and Wang, 2020). In the face of increasing competition among the many MSMEs, innovation becomes very important in enhancing and sustaining SME growth (Devaux *et al.*, 2018; Caiazza *et al.*, 2014; Haggblade, 2011). Firm-level innovation has been linked to better performance and growth of agro-food MSMEs (Gellynck *et al.*, 2015; Ho *et al.*, 2018; Kamuri, 2021; Leo *et al.*, 2022; Manogna, 2021).

Despite consensus on the significance of innovation to MSME growth and economic sustainability, there is still lack of clear understanding of what drives agri-food MSME innovation that is on the rise in most developing countries. Most studies on factors that drive MSME innovation are either focused on a developed country context, or in a non-agricultural-based context (e.g. Sawy *et al.*, 2001; Ar and Baki, 2011; Senyard *et al.*, 2014; Prajogo and McDermott, 2014; de Klerk, 2015). The few existing studies focused on specific commodities. Iza and Dentoni (2020) assessed the role of entrepreneurial orientation in driving innovation in the coffee multi-stakeholder platforms in Uganda, while Kamuri (2021) studied innovation in Kenya's leather industry. Both studies focus on the specific nodes of the target commodity value chains. However, agribusiness commodities follow a value chain and simply studying a specific node may not give a full account of the overall drivers of MSME innovation. Despite this oversight, national wide interventions to improve the performance of agri-food MSMEs usually focus on the whole agribusiness sector. Such studies that do not provide the whole picture about MSMEs innovations thus do not provide complete information for decision making. This narrow focus of previous studies forms the main motivation of this study. The study therefore seeks to provide additional insight to precursors of innovation in MSME in the agro-food sector in Uganda. In this study, we assessed whether agro-food MSMEs that have such innovation support services are more innovative than those that do not have them in place. With agribusiness value and supply chain actors increasingly recognizing the roles of other actors (Passaro *et al.*, 2022; Lwesya and Achanta, 2022; Owot *et al.*, 2022, 2023), findings of the study are relevant in the sense that agri-food chains are interlinked with innovation in one node of the value chain having a ripple effect on related markets. Additionally, the findings of this studies can inform policy, where innovation support services is prioritized while promoting agro-food MSME innovation.

The rest of the paper is structured as follows: in section 2, we conduct a brief literature review on agro-food MSME innovation and present the hypotheses to be tested. In section 3, we present the materials and methods used in the study. The results are described in section 4, and discussed in section 5. In section 6, we present the conclusion and recommendation for policy and practice. Lastly, section 7 identifies the limitations with respect to application of this study findings.

## 2. Literature review and hypotheses development

The concept "innovation" has of recent become very common when talking about business. In its ordinary usage, innovation simply refers to changes aimed at improving the existing situation. In the business language, it refers to changes in business routines and activities with the ultimate goal of making things better (Micheels and Nolan, 2016; Zawislak *et al.*, 2022). In agro-food MSME, innovation may involve changes in routine aimed at addressing challenges and improving the overall performance of the business. It entails implementation

of new ideas generated through creative thinking. The creative thinking usually focuses on increasing customer value, improving operational efficiency, learning from past errors and experience, and focusing on cost reduction (Micheels and Gow, 2008).

In the agro-food MSME sector, innovation-induced changes in routine can be summarized as changes to the product (product innovation) changes to the product marketing process (market innovation), changes to the organization or changes to the internal operations of the business (process innovation) (Caiazza *et al.*, 2014; Najib and Kiminami, 2011; Aksoy, 2017; Iza and Dentoni, 2020). In practice, these three forms of innovation can be collapsed into one or two constructs. A two-construct classification of innovation defines innovation as focusing on changes relating to improving the consumers' experience or improving operation efficiency (Aggrey *et al.*, 2021; Ho *et al.*, 2018; Caiazza *et al.*, 2014; Purba *et al.*, 2018). Innovation that targets improving the consumers' experience is referred to as customer-focused innovation and includes changes targeting the product (product innovation) and how its marketed (market innovation). On the other hand, innovation aimed at improving operational efficiency includes both process and organization innovation. This type of innovation is referred as systems-focused innovation (Purba *et al.*, 2018; Kamuri, 2021).

Research has shown that the level of innovation varies significantly among different firms (Caiazza *et al.*, 2014; Kamarulzaman *et al.*, 2021; Ho *et al.*, 2018; Iza and Dentoni, 2020; Ali *et al.*, 2021). A number of factors have shown to influence the level of innovation. A review of literature shows that the factors influencing innovation are varied. For instance, Ali *et al.* (2021) identified internal and external factors that influence innovation among a section of Indian agro-food MSMEs, while Iza and Dentoni (2020) presented the role of entrepreneurial orientation in driving innovation in the coffee multi-stakeholder platforms in Uganda. In these studies, the roles of innovation support functions have not been explicitly presented. This study assessed the drivers of innovation in the Ugandan agro-food MSMEs with the aim of identifying relevant innovation support services.

Firm-level innovation requires a supporting policy framework and the right procedure for it to be undertaken. While MSMEs owners and managers recognized the need to innovate, those that take an extra step to create a conducive environment for innovation are expected to have higher levels of innovations (Oke *et al.*, 2013; Morero, 2017). Whereas previous studies show a positive effect of presences of policies on innovations, they do not separate these effects by the type of innovation. In this study, presence of internal policies is expected to have the same effect on both customer-focused and system-focused innovations. This study thus hypothesizes that:

*H1a.* Presence of policies and principles that support innovations leads to higher levels of customer-focused innovation

*H1b.* Presence of policies and principles that support innovations leads to higher levels of systems-focused innovation

In the process of undertaking innovation, firms may acquire intellectual property (IP) associated some technologies or processes. Thus, by acquiring such intellectual properties, such firms would be considered more innovative. According to Kalanje (2006), intellectual property rights facilitates innovation. Despites this important role, Sukarmijan and Sapong (2014) argue that IPs can become challenges to MSME innovation. Consequently, acquiring IP is expected to have varied influence on the different forms of MSMEs innovation (Spithoven *et al.*, 2013). Therefore, this study hypothesizes that:

*H2a.* Acquisitions of intellection property rights are associated with higher levels of customer-focused innovation

*H2b.* Acquisitions of intellection property rights are associated with higher levels of systems-focused innovation

In addition to having the right policies in place, agri-food firms also need to undertake firm-level research aimed at product and process improvements. According to Alarcon and Polonio (2014), internal research and development is an important ingredient of agrifood innovation. In fact such research and development is a necessity for innovation given that firms are usually faced with resource scarcity (Halme and Korpela, 2014). However, research has shown that firm research and innovation has differential effects on the different forms of innovation. In this we test whether firm-level research and development has the same effect on both systems-focused and customer-focused innovation. Thus we hypothesis that:

*H3a.* Involvement in product or process improvement research improves customer-focused innovation

*H3b.* Involvement in product or process improvement research improves the level systems-focused innovation

Whereas firm-level research and development plays an important role for innovation, not all MSMEs can afford to undertake such innovations. Such firms may rely on accessing innovations from other institutions. Thus, MSMEs that have access to research output are usually more innovative that those that do not (Meuleman and De Maeseneire, 2012; Czarnitzki and Delanote, 2015). Such effects are however expected to vary across the different types of MSME innovation. This study therefore hypothesis that:

*H4a.* MSMEs that receive received research output from external organizations are more innovative in terms of customer-focused innovation

*H4b.* MSMEs that receive received research output from external organizations are more innovative in terms of systems-focused innovation

In fostering firm-level innovations staff involvement becomes very vital (Rasheed *et al.*, 2017; Demirkan *et al.*, 2022). Consequently, MSMEs that wish to increase their innovation may provide rewards for staff who are creative. However, such rewards may favor other forms of innovations at the expense of others. In this study therefore, the following hypothesis was tested:

*H5a.* Provision of rewards to creative employees improves the level of customer-focused innovation

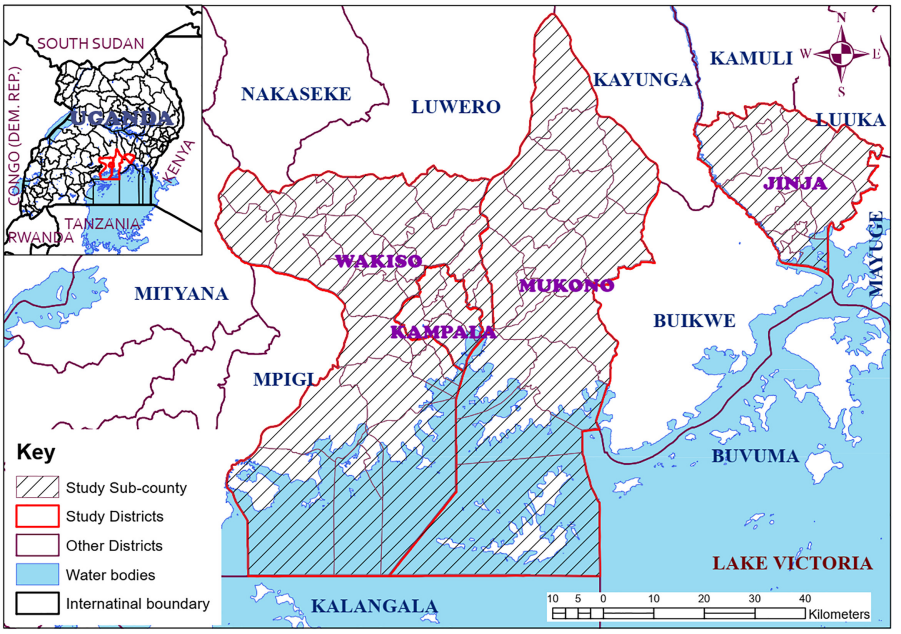
*H5b.* Provision of rewards to creative employees improves the level of systems-focused innovation

In addition to the innovation support functions, MSMEs are also dependent on a number of other factors that can be generally looked at as firm characteristics and socioeconomic factors (Ali *et al.*, 2021; Micheels and Nolan, 2016; Finco *et al.*, 2018; Moravcíková *et al.*, 2021; Asikin *et al.*, 2023). In this study, these factors were controlled so as to better understand the effects of the innovation support functions on the level of MSME innovations.

## 3. Methodology

### *3.1 Study area*

This study was conducted in Kampala City, Wakiso and Mukono districts in central Uganda and Jinja district and City in eastern Uganda (Figure 1). Kampala is the Capital City of Uganda, while Jinja city has traditionally been known as an industrial town. Wakiso and Mukono districts have also of recent seen an increase in the number of agro-based industries due to their proximity to Jinja and Kampala cities (IFC, 2021). These districts and cities have the largest concentration of agro-based MSMEs in Uganda and were ideal for




**Note(s):** This map was prepared for this study using ArcGIS version 10.3.1

**Source(s):** Author's own work/ creation

**Figure 1.**
Map of study area

this study (UIA, 2016; IFC, 2021). Most of the agro-based MSMEs are involved in agro-food, acquiring raw materials from the multitudes of smallholders spread throughout the country. Being in the capital or close to the capital city of Uganda, these locations are expected to follow the capital city dynamics (Mayer *et al.*, 2016). It is expected that these districts will have a substantial level of innovation that would warrant the study.

### *3.2 Design, population and sample*

The study applied the cross-sectional survey research design. This type of research design studies a cross-section of units at one point in time. Consequently, a cross-section of agro-food selected from the study formed the study participants. The choice of the cross-sectional research design was thus informed by the need to understand MSME innovation in the context of several agro-based firms, at a given time. In conducting the cross-sectional survey research, the study adopted quantitative techniques to data collection for collecting data on the variables under study. In studying MSME innovation, the unit of analysis was the firm. However, on the firm data was collected by interviewing the MSMEs owner. In the absence of the owner, the manager was interviewed. This choice of the person to interview on behalf of the firm was informed by the need to collect relevant information on innovation from the MSMEs. For most MSMEs, although all employees may be involved in undertaking innovation activities, it is usually the owner and/or managers who are the initiators of such activities and are thus the right persons to talk to about innovation in their respective firms. Data was collected from a sample of 516 MSMEs from different agri-food sub-sectors. This sample size was determined following Krejcie and Morgan (1970) table. With the number of MSMEs in the study area being estimated at over 100,000 (UIA, 2016; IFC, 2021), this approach would give a sample size of 384. However, with an anticipated non-response of

about 36% expected in survey research (Groves and Peytcheva, 2008), this sample size was corrected upwards to 521 MSME firms. For each of the district, a list of registered MSMEs was obtained from Uganda Investments Authority. This list formed the sampling frame. Basing on the need to have realistic representation for each category of SMEs by role in the value chain (retailer, wholesaler, processor, transporter and exporter), a representative sample for the study was selected from each sampling frame using simple random sampling.

### *3.3 Measurements and data collection*

In this study, data was collected using semi-structured questionnaires. A pretested questionnaire was uploaded to kobo-collect, an online survey tool, that was used for data collection, using tablets and smart phones. This approach is preferred to hard copy questionnaires which are prone to errors. Data was collected by a team of ten enumerator who all had background of agribusiness and was trained on the tool, prior to field work. Prior to data collection, the representatives of the selected MSMEs were taken through the purpose of the study and their voluntary participation sought for. Only those who consented to participation were interviewed.

The questionnaires contained information on MSMEs firmographics, MSME institution support and MSME innovation. Most of the variables included in this study could be easily measured directly. These include: age of MSME, annual turnover, age of MSME owner, location of MSME, MSME sub-sector and access to support services. However, MSME innovation is usually not measured directly. Measuring innovation involves use of constructs that elicit the level of innovation in the MSME. This study adopted previously used scales to measure innovation. Specifically, the scales previously used by (Micheels and Gow, 2008; Caiazza *et al.*, 2014; Gellynck *et al.*, 2015; Aksoy, 2017; Kamuri, 2021) were modified to make them suitable to the circumstances under the current study. These scales contained a set of 17 statements that are measured on a Likert scale. For purposes of this study, the scales were modified by rewording the original statements to make it applicable to the context of the study. This study adopted a six-point Likert scale ranging from "unlikely" (1) to "most likely" (6). The choice of a six-point Likert scale was informed by the need to omit the neutral choice. A six-point Likert scale was previously used by (Micheels and Gow, 2008, 2011, 2015). Previous studies have shown that a six-point Likert scale was similar to a five-point Likert scale (Preston and Colman, 2000) and having better indices in some cases (Chomeya, 2010).

### *3.4 Addressing common method bias*

The design of the questionnaire allowed for this study did not suffer from common method bias. According to Podsakoff and Organ (1986), common method bias arises due to use of the same scale/similar scale to measure both the dependent and independent variables. Consequently, where both categories of variables are measured using different approached, this bias does not arise (Podsakoff *et al.*, 2003). In this study, the dependent variables (level of innovation) were measured using Likert scale constructs while the independent variables which are the firm and demographic characteristics and dummy variables for support services were measured directly. According to Podsakoff and Organ (1986), measurement variables such as a firm's characteristics and peoples demographic characteristics usually do not lead to common method bias. This is because such variables can usually be independently verified from other sources. Consequently, common method bias was not a challenge in this study.

### *3.5 Data analysis*

After collection, the data was exported to SPSS spreadsheet for analysis. Data analysis involved descriptive, factor analysis and hierarchical regression analysis. Given the nature of the scale used

to measure innovation, exploratory factor analysis (EFA) was necessary to reduce the dimensions of the constructs and create composite variables. In this study, EFA was used to evaluate the reliability and validity of the innovation scale. The variables in this study were summarized using frequencies, percentages and means. In order to assess the influence of institutional support services on innovations, a hierarchical linear regression model was estimated, with the composite indices of innovation as dependent variables. In this study, two composite measures of innovation were related to customer-focused innovation and system-focused innovation.

Hierarchical regression allows for the controlling of the effects of one or several factors so as to observe the effects of one or several other variables on the dependent variable (Raudenbush and Bryk, 2002). In this study, two composite measures of innovation were related to customer-focused innovation and system-focused innovation. For each composite measure of innovation, a three-level hierarchical regression model was estimated. Step I of the hierarchical model which controlled for the effect of demographics characteristics in innovations is presented in Equation (1).

$$Y_i = \beta_0 + X_i'\beta_i + \varepsilon \tag{1}$$

where $Y_i$ is the level of innovation of the $i^{th}$ firm. This can be either systems-focused innovation or customer-focused innovation. $X_i'$ is a vector of explanatory variables related to the demographics characteristics of the agri-food MSME. These included: age in years, gender dummy (male), education level of the owner and district dummies. $\beta_0$ is the regression constant. $\beta_i$ is a vector of parameters associated with demographic characteristics. $\varepsilon$ is the random error term.

The second-level regression controlled for the effect of MSME characteristics on the innovation conditioned on the demographic factors. This was estimated following Equation (2).

$$Y_i = \beta_0 + X_i'\beta_i + W_j'\beta_j + \varepsilon \tag{2}$$

where $W_j'$ is a vector of MSME characteristics that can influence their level of innovation. These include: SME age in years, number of full-time workers, approximate annual expenditure in innovative activities and indicators for MSME size (micro, small and medium). $\beta_j$ is a vector of parameters associated with the MSMEs characteristics. $Y_i$ , $\beta_0$, $X_i'$, $\beta_i$ and $\varepsilon$ are as described in Equation (1).

The third and lasts level of the hierarchical regression model introduced indicator variables for institutional support for innovation to assess their moderation effects on all other predictors of both systems-focused and customer-focused innovation. This step was estimated following Equation (3).

$$Y_i = \beta_0 + X_i'\beta_i + W_j'\beta_j + Z_k'\beta_k + \varepsilon \tag{3}$$

where $Z_k'$ is a vector of indicator variables representing institutional support for innovation. These are presence of guiding principles/policies that support innovations, acquiring of intellectual properties rights, involvement in research to improve on products or process, access to research output from government or research institute and provision of reward for employees who come up with creative/innovative ideas. $\beta_k$ is a vector of parameters associated with each of indicator variables. The other parameters in Equation (3) are as described in Equation (2). During the analysis, the variables age of MSME owner, MSME age, number of full-time employees and annual expenditure on innovative activities were transformed to natural logarithms in order to improve model fit. Since there were two composite variables relating to innovation, a separate hierarchical regression model was estimated for each of these measures.

### 3.6 Exploratory factor analysis for innovation

EFA was performed on the scale items of innovation in order to test for reliability and validity of the measure. EFA was appropriate since, in this study there were 521 participants implying that there were at least 10 times more participants for each scale item (Janssens *et al.*, 2008). The study performed EFA following principal component analysis to determine the best factor solution. The principal component analysis followed the varimax rotation. In order to improve fit, EFA items with factor loading less than 0.5 were dropped (Field, 2009; Janssens *et al.*, 2008). Similarly, factors with strong cross-loadings were also dropped. Consequently, the innovation scale which had 17 items was reduced to eight items, with a two factor-solution. The Kaiser–Meyer–Olkin (KMO) test and Bartlett's test of Sphericity confirmed the adequacy of the sample for factor analysis (Table 1). The final EFA solution explained 60% of the total variation of the innovation measures. The scale items of innovation were reduced to a two-factor solution. Internal consistency of each of EFA factor solutions was assessed using Cronbach's alpha. The first EFA derived factor, had five items and was related to customer-focused innovation and explained 42% of the variance with a Cronbach alpha of 0.801. The second EFA derived factor, had three items and was related to systems-focused innovation, explaining 18% of the variance and having a Cronbach's alpha of 0.700. The Cronbach's alpha reported in this study was above 0.7, confirming internal reliability (Nunnally, 1994). All the factors' loadings of scale items in the final solutions were all above 0.5 (Table 1).

## 4. Results

### 4.1 Summary statistics

Table 2 presents summary statistics of variables relating to MSMEs in this study. In this study, 59% of those interviewed were males. The average age of the MSMEs managers was 36 years. Above 60% of the MSME owners had education levels less than a University degree, while 69% of the managers had education levels less than a University degree. Majority of the agro-food MSMEs interviewed were in Kampala (37%) and Wakiso district (36%). Jinja district had 14% of the agro-food MSMEs interviewed in this study. Sixty eight percent of the MSMEs interviewed had annual turnover of between Uganda Shillings (UGX) 10–100 million

| Scale items | F1 | F2 |
|---|---|---|
| We implement new techniques in production and processing of our products/services | 0.798 | |
| We develop new ideas of improving our products/services | 0.742 | |
| We adopt new techniques in our operations | 0.741 | |
| We usually change our products/services with respect to changing conditions | 0.689 | |
| We create new processes in our operations in order to improve efficiency | 0.682 | |
| Our pricing strategies are innovative in that it makes us the most competitive in the market | | 0.790 |
| In my firm, we have adopted ongoing collaborations with other firms as a way of improving my product competitiveness | | 0.765 |
| In our firm, there is a clear innovative power structure between everyone involved that allows for proper function of all firm activities | | 0.754 |
| *Eigenvalue* | 3.367 | 1.411 |
| *Percentage of Variance* | 42.084 | 17.642 |
| *Cumulative Percentage of variance* | 42.084 | 59.726 |
| *Cronbach's alpha* | 0.801 | 0.700 |
| Kaiser–Meyer–Olkin Measure of Sampling Adequacy (KMO = 0.812) | | |
| Bartlett's test of Sphericity (Chi-square = 1,229.683, *p*-value = 0.000) | | |

**Source(s):** Author's own work/creation

**Table 1.** Factor analysis for innovation

| Frequencies and percentages of categorical variables<br>Variable | Category | Freq | Percent |
|---|---|---|---|
| Gender | Female | 216 | 41.5 |
| | Male | 305 | 58.5 |
| Education level of SME Owner | Less than University Degree | 312 | 59.9 |
| | University Degree or above | 209 | 40.1 |
| Education level of SME Manager | Less than University degree | 358 | 68.7 |
| | University degree or above | 163 | 31.3 |
| Location of SME | Jinja | 71 | 13.6 |
| | Kampala | 195 | 37.4 |
| | Mukono | 69 | 13.2 |
| | Wakiso | 186 | 35.7 |
| Size of SME | Micro (Less than 10 million UGX) | 94 | 18.0 |
| | Small (10–100 million UGX) | 354 | 68.0 |
| | Medium (Over 100 million UGX) | 73 | 14.0 |
| There are guiding principles/policies that support innovations | No | 333 | 63.9 |
| | Yes | 188 | 36.1 |
| Has ever acquired intellectual properties rights | No | 404 | 77.5 |
| | Yes | 117 | 22.5 |
| Business is involved research to improve on products or process | No | 442 | 84.8 |
| | Yes | 79 | 15.2 |
| Received research output from government or research institute | No | 506 | 97.1 |
| | Yes | 15 | 2.9 |
| Provide reward for employees who come up with creative/innovative ideas | No | 273 | 52.4 |
| | Yes | 248 | 47.6 |
| *Means and standard deviations of quantitative variable* | | | |
| | | *Mean* | *SD* |
| Age of manager (years) | | 36 | 8.3 |
| SME Age (years) | | 7 | 5.0 |
| Number of full-time workers | | 7 | 16.7 |
| Approximate annual expenditure on innovation related activities | | 1340.883 | 6129093.5 |

**Source(s):** Author's own work/creation

**Table 2.**
Summary statistics

and could be classified as small. Only 14% had annual turnover of over UGX 100 million and were classified as medium, while 18% had annual turnover of less than UGX 10 million and were classified as micro. The average age of the MSMEs was seven years, while the number of full-time workers was also seven, with the MSMEs employing various numbers of part-time workers throughout the year. About 36% of the MSMEs owners/managers indicated that their businesses had guiding principles or policies that support innovations in their business. Only about one out of five MSMEs had ever acquired various intellectual properties rights in their business. Involvement in product or process improvement research was generally low, with only 15% of MSMEs admitting to undertaking such research. Only less than 3% also reported to ever receiving research outputs from external sources including government or research institutes. In 48% of the MSMEs, employees who come up with creative ideas were rewarded, with various forms of rewards. On average, each MSME spent about UGX 1,340,000 (about USD 383) annually on innovation-related activities.

*4.2 Level of SME innovation*

The mean score for customer-focused innovation was 5.26, while the mean score of system-focused innovation was 4.79 (Table 3). Given that the maximum score of both customer-focused and systems-focused innovation was six (six-point Likert scale), the mean scores reported in thus study translates to 87.7% level of customer-focused innovation and 79.8% level of systems-focused innovation. A comparison of the mean innovation score across MSME size (turnover) shows that the level of customer-focused innovation did not vary significantly by MSME size (Table 3). However, the level of systems-focused innovation varied significantly by SME turnover. Specifically, MSMEs with annual turner of UGX 100 million were significantly less innovative in terms of systems focus, than MSMEs with less than UGX 100 million.

*4.3 Hierarchical regression results*

Table 4 presents the hierarchical regression with the dependent variable customer-focused innovation, while Table 5 presents the hierarchical regression with the dependent variable systems-focused innovation. In both models, the Durbin–Watson test values were between 1.5 and 2.5, signifying that the models were free from potential serial correlation. Similarly, the maximum variance inflationary factor value was less than 2, far below the threshold of 10 to suspect multicollinearity. All the *F*-statistics were significant implying model fit. The *F*-change statistics were also significant implying addition of explanatory variables to the second and third levels of the hierarchical regression were relevant.

Results show that MSMEs whose owners had university degree or higher level of education had higher levels of customer-focused innovation ($\beta$: 0.097, $p < 0.05$), but lower levels of systems-focused innovation. Age of the MSME had a negative significant influence on levels of customer-focused innovation ($\beta$: −0.106, $p < 0.05$), but, was not a significant factor for systems-focused innovation. This implies that younger MSMEs were more innovative in terms of customers-focused innovation than older MSMEs. Similarly, the number of full-time employees employed by the MSMEs also had a negative significant influence on customer-focused innovation ($\beta$: −0.089, $p < 0.1$), but was not significant for systems-focused innovation. Annual expenditure on innovation had positive significant influence on both customer-focused ($\beta$: 0.231, $p < 0.05$) and systems-focused innovation ($\beta$: 0.451, $p < 0.05$). MSMEs who had guiding principles and policies on innovation also had significantly higher levels of both customer-focused ($\beta$: 0.217, $p < 0.01$) and system-focused innovations ($\beta$: 0.071, $p < 0.1$). These findings support hypothesis *H1a* and *H1b*. Acquisition of intellectual property rights was significantly associated with higher levels of both customer-focused ($\beta$: 0.115, $p < 0.01$) and system-focused ($\beta$: 0.159, $p < 0.01$) innovations. These finding supports hypothesis

| SME Tier | Annual turnover | Customer-focused innovation Mean | SD | System-focused innovation Mean | SD |
|---|---|---|---|---|---|
| Micro | Less than UGX 10 million | 5.35[a] | 0.41 | 4.78[a] | 0.81 |
| Small | UGX 10 million – 100 million | 5.24[a] | 0.58 | 4.84[a] | 0.80 |
| Medium | Over UGX 100 million | 5.22[a] | 0.61 | 4.53[b] | 0.91 |
| Average | | 5.26 | 0.56 | 4.79 | 0.82 |
| | *F*-value | 1.644 | | 4.185 | |
| | *p*-value | 0.194 | | 0.016 | |

**Table 3.** Comparing level of innovation by SME turnover

**Note(s):** SD=Standard deviation; Means on the same column with different superscript are significantly different at $p < 0.05$

**Source(s):** Author's own work/creation

| Variable | Beta (*t*-statistics) Model 1 | Model 2 | Model 3 |
|---|---|---|---|
| Intercept | 5.889 (14.650) *** | 5.443 (13.241) *** | 4.663 (12.630) *** |
| *Demographics* | | | |
| Log_age | −0.084 (−1.897) * | −0.031 (−0.665) | 0.032 (0.782) |
| Male | −0.094 (−2.188) ** | −0.063 (−1.477) | −0.063 (1.687) * |
| Educ_owner | 0.227 (5.196) *** | 0.218 (4.968) *** | 0.097 (2.407) ** |
| Jinja | 0.034 (0.721) | 0.045 (0.925) | 0.010 (0.206) |
| Mukono | 0.124 (2.692) *** | 0.128 (2.804) *** | 0.092 (2.226) ** |
| Wakiso | 0.104 (2.189) ** | 0.024 (0.499) | 0.063 (1.418) |
| *SME Characteristics* | | | |
| Log_SMEage | | −0.075 (−1.549) | −0.106 (2.445) ** |
| Log_full time | | −0.088 (−1.649) | −0.089 (−1.846) * |
| Log_inno_exp | | 0.235 (5.340) *** | 0.231 (5.682) *** |
| Micro | | 0.007 (0.160) | 0.076 (1.826) * |
| Medium | | 0.047 (0.962) | −0.007 (−0.160) |
| *Innovation support* | | | |
| Innov_policy | | | 0.217 (5.003) *** |
| Acquire_IP | | | 0.115 (2.615) *** |
| Innov_research | | | 0.030 (0.636) |
| Research_output | | | −0.037 (−0.962) |
| Reward_creative | | | 0.336 (8.343) *** |
| *Model parameters* | | | |
| $R^2$ | 0.093 | 0.155 | 0.352 |
| Adjusted $R^2$ | 0.083 | 0.137 | 0.331 |
| *F*-value (sig) | 8.802 (0.000) | 8.508 (0.000) | 17.090 (0.000) |
| $R^2$ Change | – | 0.062 | 0.196 |
| *F*-change (sig) | – | 7.489 (0.000) | 30.540 (0.000) |
| Max VIF | 1.283 | 1.712 | 1.809 |
| Tolerance | 0.779–0.961 | 0.584–0.922 | 0.553–0.909 |

**Note(s):** Durbin–Watson = 2.109; Innov_policy = dummy (1: has guiding principles or policies supporting innovation, 0: none); Acquire_IP = dummy (1: has ever acquired intellectual properties rights, 0: has never); Innov_research = dummy (1: Involvement in product or process improvement research, 0: no involvement), Research_output = dummy (1: received research output, 0: did not receive); Reward_creative = dummy (1: Reward creative employees, 0: no reward); *, ** and *** implies significance at $p < 0.1$, $p < 0.05$ and $p < 0.01$, respectively

**Source(s):** Author's own work/creation

**Table 4.** Hierarchical regression results for factors influencing customer-focused innovation

*H2a* and *H2b*. Involvement in product or process improvement research had a significant positive influence on system-focused innovation ($\beta$: 0.116, $p < 0.05$) but not on customer-focused innovation. These finding supports hypothesis *H3b* but not *H3a*. Access to research output by the MSME did not have any significant influence on innovation, implying that hypothesis *H4* is not supported. Finally, reward of creative employees was associated with significantly higher levels of customer-focused innovation ($\beta$: 0.336, $p < 0.01$), but significantly lower levels of systems-focused innovation ($\beta$: 0.111, $p < 0.05$). These finding supports hypothesis *H5a* but not *H5b*.

## 5. Discussion

Innovation in MSMEs and specifically agro-food MSMEs is becoming an important ingredient of the MSME growth and sustainability (Devaux *et al.*, 2018; Ndiaye *et al.*, 2018; Ilie *et al.*, 2022).

| Variable | Beta (*t*-statistics) Model 1 | Model | Model 1 |
|---|---|---|---|
| Intercept | 6.422 (11.174) *** | 5.380 (10.041) *** | 5.022 (9.486) *** |
| *Demographics* | | | |
| Log_age | −0.131 (−3.037) *** | −0.084 (−2.049) ** | −0.050 (−1.226) |
| Male | −0.080 (−1.917) * | −0.031 (−0.813) | −0.038 (−1.027) |
| Educ_owner | −0.046 (−1.085) | −0.083 (−2.133) ** | −0.073 (−1.846) * |
| Jinja | 0.268 (5.825) *** | 0.322 (7.510) *** | 0.296 (6.457) *** |
| Mukono | −0.073 (−1.620) | −0.038 (−0.942) | −0.071 (−1.744) * |
| Wakiso | 0.222 (4.765) *** | 0.110 (2.522) ** | 0.130 (3.013) *** |
| *SME Characteristics* | | | |
| Log_SMEage | | −0.033 (−0.753) | −0.043 (−1.001) |
| Log_full time | | 0.011 (0.223) | −0.040 (−0.852) |
| Log_inno_exp | | 0.473 (12.086) *** | 0.451 (11.315) ** |
| Micro | | −0.025 (−0.608) | −0.035 (−0.873) |
| Medium | | −0.035 (−0.820) | −0.094 (−2.175) |
| *Innovation support* | | | |
| Innov_policy | | | 0.072 (1.707) * |
| Acquire_IP | | | 0.159 (3.695) *** |
| Innov_research | | | 0.116 (2.471) ** |
| Research_output | | | −0.053 (−1.404) |
| Reward_creative | | | −0.111 (−2.819) *** |
| *Model parameters* | | | |
| $R^2$ | 0.134 | 0.329 | 0.377 |
| Adjusted $R^2$ | 0.124 | 0.315 | 0.357 |
| *F*-value (sig) | 13.218 (0.000) | 22.720 (0.000) | 19.053 (0.000) |
| $R^2$ Change | – | 0.196 | 0.048 |
| *F*-change (sig) | | 29.695 (0.000) | 7.697 (0.000) |
| Max VIF | 1.283 | 1.712 | 1.809 |
| Tolerance | 0.779–0.961 | 0.584–0.922 | 0.553–0.909 |

**Note(s):** Durbin–Watson = 1.876; Innov_policy = dummy (1: has guiding principles or policies supporting innovation, 0: none); Acquire_IP = dummy (1: has ever acquired intellectual properties rights, 0: has never); Innov_research = dummy (1: Involvement in product or process improvement research, 0: no involvement), Research_output = dummy (1: received research output, 0: did not receive); Reward_creative = dummy (1: Reward creative employees, 0: no reward); *, ** and *** implies significance at $p < 0.1$, $p < 0.05$ and $p < 0.01$, respectively

**Source(s):** Author's own work/creation

**Table 5.** Hierarchical regression results for factors influencing systems-focused innovation

Agro-food MSME growth is critical to sustaining the agricultural value chains (Dagbelou *et al.*, 2021; Ilie *et al.*, 2022) that supports millions of smallholder farmers (World Bank, 2021). This study assessed the level of innovation of agro-food MSMEs in Uganda. Findings show much of agro-food MSMEs innovations focus on the customers, and did not vary by MSMEs turnover level. Such findings point to the efforts that agro-food MSMEs put in order to provide products that are required by consumers whose needs and demands are not static. A study by Kamarulzaman *et al.* (2021) presented high levels of correlation between MSME's customer orientation and product-market innovation. These findings suggest that agro-food MSMEs innovation seems to be linked to market forces that are highly dynamic (Park *et al.*, 2019; Zahoor *et al.*, 2021). Consequently, MSMEs prioritized customer-focused innovations in order to increase their competitiveness in a rapidly changing market environment. System-focused innovation on the other hand involves changes around the organizations and processes.

This study also identified factors that drive this much-needed agro-food MSME innovation. Whereas a study by Ali *et al.* (2021) reported that MSME age did not influence the level of MSME innovation for selected agro-food firms in India, in this study, MSME age was a significant determinant of customer-focused innovation. Specifically, newly created agro-food MSMEs were found to be more innovative creating value for customers. Similar findings were reported by Prajogo and McDermott (2014) in a study on Australian service firms. In a bid to capture the market and be competitive, and capture some market share, newly created MSMEs have come up with better ways of attracting customers from other already existing agro-food MSMEs. This is so given that most agro-food products complement each other. It is thus possible that new MSMEs dealing in similar products like for their competitors have to please "unsatisfied" consumers from the competitors in order to gain market entry. As the MSMEs become established with a known customer base, customer-focused innovation reduces.

Findings from the current study also show the relationship between number of employee and innovation. It shows that there is a negative relationship between number of full-time employees and customer-focused innovations but no significant relationship with systems-focused innovation. In essence, agro-food MSMEs that employ fewer staff have higher levels of customer-focused innovation. A study by Ali *et al.* (2021) reported no significant influence of number of employees on innovation, while a study by Finco *et al.* (2018) reported a positive influence of number of employees on firm innovativeness. A study by Prajogo and McDermott (2014) observed the influence of employee number in moderating factors influencing innovation. These findings suggest differences in employee productivity between firms with many employees and those with fewer employees. Employee productivity has been shown to have a positive effect on innovation (Preenen *et al.*, 2017). These employee productivity is driven by employee motivation and reward (Gupta, 2020; Lasisi *et al.*, 2020). Such rewards may be informed of incentives associated with meeting some sales target. Employee motivation and reward has been shown to enhance the level of creativity (Khan and Mohiya, 2020). In this study, MSMEs that provided reward to employees for being creative had higher levels of customer-focused innovation but lower levels of systems-focused innovation. This findings suggest that such rewards focuses in employee interactions with the clients. As such, these employees would come up with the best ways of handling the many clients.

In order to enhance MSME innovation, business owners may undertake deliberate efforts to enhance the level of innovation in the business. In this study, agro-food MSMEs that had policies and principles to support innovation in place, where more innovative, than those who did not. These findings are not surprising given that the purpose of such policies is to foster innovation. According to Moravcíková *et al.* (2021), presence of existing internal regulations ranks highly in enhancing MSME innovation. Similarly, MSMEs owners who understand the value of innovation would take deliberate efforts and acquire intellectual property rights to help them improve business performance. Such intellectual property rights usually leads to better performance by improving efficiency and making such firms competitive (Davcik *et al.*, 2021).

Internal research and development activities are an important pathway to innovation. Although, not all MSMEs are involved in some product or process improvement research, findings from this study show that those involved had higher levels of systems-focused innovation. A similar finding was reported by Ali *et al.* (2021). There was however no significant influence of internal research on customer-focused innovation. This finding suggests that, internal research, conducted by agro-food MSMEs in Uganda usually targets improving operational efficiency or cost reduction, as opposed to improving customer experiences. Consequently, agro-food MSMEs involved in internal research would also have higher levels of systems-focused innovation. This study also finds no evidence of the

influence of receiving external research products on innovation. In essence, only less than 3% of the MSMEs receive such external research output form government. Whereas government support is expected to have a positive influence on MSMEs performance (Alkahtani *et al.*, 2020).

## 6. Conclusion and policy implications

This study identifies the drivers of agro-food MSME innovation in Uganda. It shows that customer-focused innovation was more common than systems-focused innovation. These innovations are driven by several factors including MSME age, number of full-time employees, presence of internal policies and principles supporting innovation, internal research and reward of creative employees. The findings of this study provide insights into factors that can be harnessed to increase the level of innovation of agro-food MSMEs in Uganda. The findings of these study have both practical and theoretical implications. Practically, the study proposed ways of enhancing agro-food MSME innovation. This includes encouraging agro-food MSMEs to develop internal policies and principles regarding innovations that would increase the overall level of agro-food MSME innovation. Similarly, encouraging agro-food MSMEs to conduct internal research and also provide reward to creative employees would translate into higher levels of innovation. Achieving these requires deliberate efforts of governments and other non-state actors with interest in support MSMEs growth to undertake activities aimed at creating awareness on the benefits of developing policies to support research, awareness about the need to reward creativity and building the capacity of MSMEs in conducting internal research. Theoretically, this study extends the literature on innovation to agro-food MSMEs, a sector that is increasing becoming important for growth and development of most African countries including Uganda. Studies on agro-food MSME innovation have been generally lacking. By assessing the drivers of MSMEs innovation in agro-food sector of a developing country, this study becomes theoretically relevant.

### *6.1 Limitations of the study*

The extent of application of this study findings are not devoid of limitations. First, the extent of application of this study findings can only be relevant to circumstance similar to the study area. This study was conducted in an agrarian developing country where most of MSMEs operate informally (without any formal registration). As such, the findings can only be applicable in similar conditions. Secondly, the study focused on agri-food MSMEs, its findings can thus not be applied to non-agri-food circumstances.

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