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Understanding smallholder preferences for joint ventures in Ghana's rice sector: Improving market access through inclusive business models

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ABSTRACT

Efforts to connect farmers with markets in an inclusive manner have gained prominence within organizations like the Food and Agriculture Organization of the United Nations (FAO) and Inclusive Business Models (IBMs) have emerged as a promising avenue for achieving this objective. Currently, the adoption of IBM structures remains limited, particularly in developing countries, resulting in a paucity of information on motivating factors behind farmer engagement. This study employs a discrete choice experiment to discern these preferences, focusing on a joint venture model within the rice sector in Ghana. Data from face-to-face surveys with smallholder rice farmers analysed with a latent class model revealed heterogeneity in preferences towards IBM attributes, with a majority (55 per cent) choosing alternatives that were consistent with a joint venture business model. These related to level of investment and decision making, quality standards, price, payment schedules and control. The study also identified demographic and experiential characteristics of farmers willing to engage with IBMs. Such farmers tended to be more educated, younger, possess greater experience in rice farming, manage smaller farms, have experience with contracts, invest in processing equipment, and infrequently adopt new production practices. These findings underscore the potential to enhance the quality of domestically produced rice through IBMs and advocate for government intervention to overcome barriers, especially in the context of investment. Additionally, the results suggest that targeting younger farmers with prior contract-selling experience could encourage participation in IBMs.

1. Introduction

The rice sector in Ghana contributes to the socio-economic development of the country in various ways, including employment and income generation, and helping meet the nutritional needs of its citizens. Rice consumption patterns in Ghana have undergone a rapid transformation over the past decade, further enhancing the potential for this sector to contribute to the food security and development goals of the country. Annual rice consumption per capita increased from 24 kg in 2012/13 to 35 kg in 2016/17 ([Ghana Statistical Services, 2018](#)); where urban consumers account for 70 per cent of national consumption ([IFPRI, 2020](#)). In addition, the increasing number of restaurants and fast-food vendors in major cities and towns have increased the demand for rice ([Global Agricultural](#)

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International Network, 2019).

In 1998, a study by Asuming-Brempong showed that Ghana had the appropriate agronomic conditions to produce rice throughout the year (Asuming-Brempong, 1998). These favourable conditions, coupled with a potential domestic market of about 25 million consumers, suggested that there were great opportunities for the development of a vibrant rice sub-sector. However, several constraints have stifled the growth of the domestic value chain despite the right agronomic conditions being present. According to Ayeduvor (2018), the low demand for local rice in Ghana has been attributed in part to the relatively low quality of locally produced rice. Even though there are about 30 local rice varieties cultivated, limited information on the characteristics of the varieties makes the identification and further improvement of these varieties difficult (Dzudzor, 2013). In addition, although local rice (parboiled, white, and brown) is superior from a nutritional standpoint, it is still less preferred to imported rice by most consumers due to its perceived poor quality (Ouédraogo et al., 2021). Another factor that limits the demand for local rice, according to both smallholder farmers and millers, is poor quality or inappropriate milling equipment. This reduces the quality and uniformity of the milled grains, making local rice less competitive vis-à-vis imported grains (Addison et al., 2015; Ibrahim et al., 2023). Additionally, it hinders millers' ability to consistently produce a sufficient amount of high-quality rice year-round, resulting in periods when local rice may be unavailable.

Aside from the production and processing-related problems faced by smallholders, farmers in rural areas have limited access to knowledge and information about urban market demand. It is likely that because farmers have no access to commercial markets and have no information on the trending varieties and current prices, there is little incentive to increase or improve their yields. To validate this claim empirically, Addison et al. (2015) analysed the effect of a rice value chain development initiative on domestic rice production in the Ahafo Ano North District of Ghana. Their study showed that domestic production had increased progressively over the decade since the start of the initiative and indicated that the emergence of the rice value chain increased market access for smallholder rice producers. The newly established value chain also created a ready market for local produce at a reasonable price, so rice production had become a lucrative business in the district, attracting many participants.

Another major problem is the exploitation of smallholder farmers that arises because of their lack of market information about urban market demand (e.g. varieties sought, grades, price points). This further reduces their incentive to adopt new varieties or improve yields. The market for locally produced rice has been described as oligopsonistic; where many farmers were supplying a few powerful downstream buyers who often dictated prices (Angelucci et al., 2013). Amanor-Boadu (2012) pointed out that the value chain for locally produced rice comprises farmers selling paddy rice directly to local millers who then sell the milled rice to wholesalers or retailers. Local farmers also sell their paddy or milled rice directly to aggregators and rural consumers. However, the market of locally produced rice barely extends into the urban areas. Smallholder farmers can therefore only realise a small proportion of the value of the rice they deliver. Wholesalers, aggregators, and millers in the large cities hold market power and pay lower prices for the produce. This hinders farmers' chances of increasing their income or capabilities of increasing production.

Lastly, access to credit is a challenge for smallholder farmers. Rural banks and microfinance products and systems have been inefficient in successfully lending uncollateralised loans to farmers, and this prevents them from accessing these products (Kugbe, 2015; Sackey-Teye and Tetteh-Quarshie, 2022). Also, commercial banks seldom offer financial services to farmers because a lack of reliable information about creditworthiness and inadequate collateral imposes high transactions cost (Sutton and Jenkins, 2007). This imposes great challenges for farmers looking to undertake a value addition process that requires loan financing.

Inclusive business models have long been identified as a strategy to address the smallholder farmer challenges of inaccessibility to input and output markets, lack of information, capital and technology and an inability to reach the economies of scale needed to compete in high value supply chains (Hahn, 2012). IBMs seek to integrate smallholder farmers who have the potential to become financially viable as producers, processors, and distributors in value chain processes. Governments, donor organizations, the private sector and leading agri-food companies who aim to enhance the compatibility between agribusiness expansion and rural livelihoods in developing countries have embraced this concept (Chamberlain and Anseuw, 2019; German et al., 2018; Woodhill, 2016; Mangnus, 2023).

A limited number of case studies provide detail on how Ghanaian smallholders have attempted to increase their rice sales through inclusive business approaches such as collective marketing, farmer organizations, and contract farming (Bidzakin et al., 2019; Dubbert, 2019). However, most rice policies in Ghana are production-oriented, focusing on increasing yield rather than market access and quality improvement. As such, they tend to have a limited focus on integrating the smallholders into the market because they do not consider the value chain in which they are embedded in, or excluded from (Hounkonnou et al., 2012). It is therefore argued that with a suitable IBM, smallholder rice farmers in Ghana can be moved up a level in the value chain from being producers and suppliers to being more involved as processors.

A joint venture (JV) is a specific IBM with the potential to address the issues behind the low demand for local rice in Ghana and involve smallholder farmers in the value chain processes. JVs are strategic alliances where two or more entities, usually businesses, form a partnership to share markets, intellectual property, assets, knowledge and profits as well as sharing the financial risks and rewards (Allen, 2019). JV structures can take many forms, but they include systems in which an existing farm collaborates with other farmers and/or investors. JV structures can overcome economies of scale as well as managerial and financial constraints that limit their efficiency and uptake of productivity-enhancing technologies (Hughes et al., 2011; Gladigau, 2013). Although limited empirical research has been conducted within a developing country context, subjective evidence shows that JV models can help farm businesses become more profitable (Gladigau, 2013).

However, before we can advocate for a JV model, we need to know which aspects of such a model are appealing to smallholder farmers. Given that JV structures are not currently widely adopted within the farm business community even in developed countries (Kragt et al., 2019), stakeholders seeking to reorient smallholders from subsistence farming to 'farming as a business' have to understand the attributes of an IBM that are most valued by farmers. The objectives of this study are to use a discrete choice experiment to

explore farmers' preferences for JV model attributes, assess the proportion of the smallholders interested in such a model, and identify socioeconomic factors associated with their willingness to participate. In eliciting preferences for these attributes, it is expected that smallholders will choose the attributes that make them more likely to participate in the JV model. The outcomes of a well-executed discrete choice experiment (DCE) can thus offer valuable insights to policymakers, aiding in the enhancement of Joint Venture (JV) designs and providing a deeper understanding of the advantages stemming from altering specific attributes of the business model (Champ, 2003). Results from a DCE extend beyond simply determining whether an option is preferred or not, shedding light on how changes in the levels of each attribute influence individual decision-making processes (Bateman et al., 2002).

This section has provided a general introduction to the study. The next section reviews the relevant literature that explores empirical efforts to understand smallholders' institutional preferences, identifies key features of joint venture models that may be attractive to smallholders, and identifies characteristics of smallholders that may influence engagement with a JV. Section 3 describes the study's methods and outlines the data collection process. The empirical estimation and results are then presented in Section 4. Section 5 provides a discussion of the results before Section 6 draws general conclusions, presents policy recommendations, and identifies potential limitations of the study.

2. Literature review

2.1. Review of literature on market integration initiatives: choice experiment studies

The review of relevant literature begins by investigating empirical efforts to gain a deeper understanding of smallholder preferences for institutional arrangements that establish connections with high-value markets. This aligns with the primary goal of this study. Much of this literature is rooted in transaction cost economics, where contracts play a central role in facilitating farmers' engagement with various stakeholders within the value chain. As a result, most of the studies that look at farmer preferences for institutional arrangements that provide them with additional control over their output and marketing decisions focus on contracts. Choice experiments have been used to study smallholder preferences for contract design attributes within the empirical context of sweet peppers in Thailand (Schipmann and Qaim, 2011), seed potatoes in Ethiopia (Abebe et al., 2013), rice in Benin (Arouna et al., 2017; Van den Broeck et al., 2017), and vegetable growers in Kenya (Ochieng et al., 2017). These studies reveal important insights into the preferences of smallholder farmers when it comes to contractual arrangements. Smallholder farmers value written contracts (Abebe et al., 2013) with familiar traders (Schipmann and Qaim, 2011), the provision of input and technical support (Abebe et al., 2013; Schipmann and Qaim, 2011; Van den Broeck et al., 2017), flexibility in terms of quality and price options (Abebe et al., 2013), prompt payment upon delivery (Van den Broeck et al., 2017; Arouna et al., 2017; Ochieng et al., 2017), predetermined agreements on quantity (Arouna et al., 2017) and quality (Ochieng et al., 2017) to be supplied, and a limited role for non-farmer partners in governance (Arouna et al., 2017). When faced with the necessity of delegating or sharing decision-making authority, they express a preference for fellow farmers. Interestingly, empirical findings vary regarding the tenure of contracts, with some favouring short-term relationships (Arouna et al., 2017) while others opt for long-term commitments. Furthermore, smallholders generally have an aversion to stringent restrictions on input usage (Van den Broeck et al., 2017). Personal characteristics, such as prior contract experience, resource constraints on small farms, and an increase in off-farm income, play a significant role in shaping contract preferences among smallholder farmers. Notably, all studies explicitly exploring decision-maker heterogeneity have identified substantial variations in preferences across smallholder farmers.

Only two studies employing choice experiments (CEs) investigated farmer preferences for more comprehensive IBMs, as opposed to contract design. Alho (2019) explored the preferences of dairy farmers in Finland regarding investment attributes for cooperatives aimed at attracting investment capital. Through a choice experiment, novel cooperative investment instruments were tested, and data was analyzed using a random parameter logit model. While preferences regarding the inclusion of outside investors in the cooperative were diverse, members generally expressed a positive view of the hypothetical investment instruments. Additionally, Finnish farmers displayed a preference for determining residual returns based on capital. In a similar vein, Kragt et al. (2019) utilized a CE to examine the attractiveness of various joint venture structures to Australian grain farmers. The results from a four-class latent class model revealed significant unobserved heterogeneity in preferences, although all respondents shared a preference for structures that did not require them to relinquish control over input or operational decisions. The authors concluded that the adoption of joint venture structures is unlikely to become widespread among Australian grain farmers, instead finding appeal among a specific niche of growers aiming to enhance the scale, productivity, or profitability of their farm enterprises in the long term.

A notable gap in the empirical application of choice experiments conducted on farmer engagement with institutions that integrate them into higher value supply chains is the lack of focus on institutional arrangements other than contracts, particularly within a developing country context. To complement the existing studies and address the gap in the literature, this research uses a discrete choice experiment to identify a range of attributes that make JV models desirable for smallholder rice farmers in Ghana, and to determine the broader factors influencing the likelihood that farmer will participate in such a model.

2.2. Identifying characteristics of a JV that influence farmer participation

The initial stage in designing a discrete choice experiment involves identifying relevant attributes and their associated levels. To accomplish this, we conducted a comprehensive literature review to identify potential characteristics of a joint venture arrangement that smallholder rice farmers in Ghana might find attractive. Previous applications of choice experiments to contracts and value adding models were reviewed along with general literature relating to joint ventures and contract arrangements (e.g., Hoang and Nguyen,

2023). In addition, the grey literature relating to past and ongoing business models in Ghana were analysed to gain a deeper understanding of the local context. Ultimately, six relevant attributes associated with joint venture models were identified. Four of the attributes are related to farmers' potential role in the JV as rice suppliers: quality specification, price benefits, timing of payment, cropping decision rights. The two other attributes were related to farmers' potential role as partners in the JV: investment and benefit structure and control rights.

Investment requirements and benefit structure: A review of JV models by Vermeulen and Cotula (2010) identified financial investment as an essential aspect of JV structures. The investment and benefit attributes of the JV indicate the level of investment required by each shareholder which is linked to the profits and dividends to be received from the business. Previous studies have clearly indicated that high investment requirements discourage farmer participation in business models (Bandon et al., 2009; Ola and Menapace, 2020a)

Control rights: The control rights of a JV represent the rights granted to farmers and their business partners to vote and make strategic decisions concerning processing and value-added processes. Strategic decisions are normally made jointly by the partners in joint ventures, and this is done through a board of trustees or a similar institution. The main shareholder typically has the last say, but board representation is not always proportional to shareholding (e.g., it may be possible for smallholders to obtain a higher number of trustees than their equity participation would seem to allow) (Vermeulen and Cotula, 2010). Previous studies have shown that farmers are not open to sharing ownership with external parties and restricted rights to them, but in the presence of financial distress, they were willing to lose some level of control (Alho, 2019)

Quality specifications: To achieve the goal of adding value to locally produced rice, the JV is likely to demand good quality paddy with consistency in grain size and weight. It is anticipated that farmers will be required to meet the JV's quality standards because the JV is expected to face the majority of market risk as off-takers of rice from farmers. Previous studies have shown that a strict (fixed) quality specification is more acceptable to farmers if it is associated with premium benefits or a higher price option (Abebe et al., 2013)

Flexible versus fixed price agreements for rice: The price at which paddy will be sold to the JV is usually determined by an established agreement in a supply contract. Empirical evidence on flexible versus fixed pricing is mixed. Some studies showed that farmers preferred a model with fixed pricing as it guarantees a minimum price to their product, however, other studies indicated that farmers also preferred flexible prices as they perceive that the market price at the time of sale may be higher than the fixed price they agreed with the contractors. (Abebe et al., 2013; Arouna et al., 2017; Ocheing et al., 2017; Van den Broeck et al., 2017; Ola and Menapace, 2020a)

Timing of payment: This attribute represents the time arrangement for payment of the paddy supplied. Most studies have revealed that delayed payments reduce farmers' probability of participating in IBMs. Rice farmers preferred agreements that ensured they received their payment as soon as they delivered their produce (Abebe et al., 2013; Van den Broeck et al., 2017; Ola and Menapace, 2020a).

Cropping decision rights: This attribute specifies which stakeholder makes decisions regarding the cultivation of the paddy. This includes the planting time, rice variety, fertilizer to be used, quantity of paddy to produce, farming practices and agrochemicals. Farmer level decision making is attractive because it allows smallholders to directly manage risk on the farm. Previous studies have established that farmers were likely to participate in IBMs and contractual arrangements that involve working with individuals in their social groups, as they are perceived to be trustworthy (Schipmann and Qaim, 2011; Gelaw et al., 2016; Ola and Menapace, 2020a). Other researchers have revealed that while farmers preferred individual farm-level decisions, they were more willing to delegate control to their farmer organisation rather than the trading firm (Arouna et al., 2017; Al Ruqishi et al., 2020).

2.3. Smallholder characteristics likely to influence JV participation

We are able to draw insights from multiple empirical studies about the personal characteristics of smallholder farmers that influence their engagement in integrated business models, thus supporting the third objective of our study. Several previous studies have established that younger farmers are usually innovative and less averse to trying new practices (Etwire et al., 2013; Martey et al., 2014; Lynch et al., 2018). Zheng et al. (2012) and Bernard and Spielman (2009) found that farmers with a higher level of education and access to information were more likely to seek out new opportunities, including agribusiness projects. Martey et al. (2014) established that the likelihood of farmers to participate in business models increased as their income increased. Fischer and Qaim (2012) and Bernard and Spielman (2009) found that farmers who owned a piece of land and other farming assets were more willing to participate in marketing collectives. Previous studies have revealed that female farmers were more likely to participate in market interventions because the marketing of agricultural produce is dominated by women. However, male farmers were also likely to participate (Martey et al., 2014). Finally, Chen and Liang (2020) established that entrepreneurial commitment positively affected the farmers' intention to try new agricultural initiatives, and this was higher in older farmers than in younger farmers. Past work also showed that risk averse farmers are more likely to be members of an integrated business model (Zheng et al., 2012).

2.4. Method

The theoretical foundation for discrete choice analysis was established from Lancaster (1966) characteristics theory of value where individuals were said to derive utility from the characteristics of a product instead of the product as a whole. Choice models are also consistent with random utility theory, which states that people choose what they prefer, but these preferences are not entirely observable to the researcher and are therefore specified with a random component.

2.5. Model specification

Choice experiments have been widely used to better understand the decision making process in a plausible, but hypothetical setting. In this application we hypothesize that the low rates of engagement with IBMs in Ghana may relate to certain institutional arrangements that are difficult to meet or not favoured by farmers. This is tested by examining farmers’ choices among alternatives with hypothetical variations in attribute levels. A latent class model is used to explore the degree of heterogeneity of farmer preferences for JV attributes. Our broad objective is to develop a more nuanced understanding of which attributes of JVs are more attractive to smallholder farmers, and whether there may be farm or farmer characteristics that are associated with a greater propensity to engage with such institutions.

If we consider a farmer’s choice of business model and assume his or her utility depends on choices made from a choice set, which includes all possible model attributes, then the farmer’s utility function can be expressed as:

$$U_{ijt} = V_{ijt} + \varepsilon_{ijt} \tag{1}$$

where, for any farmer i , U_{ijt} represents the level of utility associated with choice alternative j in choice situation t . According to random utility theory, utility U_{ijt} can be expressed as a function of an observable component (V_{ijt}) and an error component (ε_{ijt}). Assuming that the relationship between the observed component of utility and the attributes is a linear function of the attribute variables and the rational farmer chooses the JV alternative that results in maximum utility, we can represent the observed component of utility as follows:

$$V_{ijt} = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + \dots + \beta_K X_{Kt} \quad i = 1, 2, \dots, N; j = 1, 2, \dots, J; t = 1, 2, \dots, T \tag{2}$$

The choice experiment allows us to estimate smallholder preferences for the different attributes of the JV included in the survey.

2.5.1. The multinomial logit (MNL) model

If the ε_{ijt} s are independently and identically distributed across the j alternatives and n individuals as a type I extreme value distribution, [Louviere et al. \(2000\)](#) showed that the probability of farmer i choosing alternative j in choice task t was given by the multinomial logit (MNL) model:

$$P_{ijt} = \frac{\exp(V_{ijt})}{\sum_{j=1}^J \exp(V_{ijt})} \tag{3}$$

The above model implicitly assumes that preferences are homogeneous among all respondents and this model is essential in analysing smaller sample sizes because it has relatively few parameters. Empirically, this model has been used in choice studies involving smallholder preferences towards contract farming ([Abebe et al., 2013](#)) and favoured characteristics of local traders ([Gelaw et al., 2016](#)).

2.5.2. Latent class specification

To account for heterogeneity among farmers’ responses, a latent class model was estimated. Latent class modelling assumes that smallholders’ preferences are constant within a class but vary between them ([Boxall and Adamowicz, 2002](#); [Greene and Hensher, 2003](#); [Hensher et al., 2015](#)). An implicit assumption of the LCM is that individual behaviour depends on observable attributes and on latent heterogeneity that varies with factors that are unobserved by the researcher. The population is assumed to consist of a finite number of groups of individuals. The groups are heterogeneous, with common utility parameters (the betas) for the members of each group, but the groups themselves are different from one another. The analyst does not know in advance which individual is in which class, and the maximum likelihood estimation process simultaneously determines parameter estimates and class membership. The classes are established by combining the respondents’ choices in the choice experiment with the socioeconomic traits included in the model to define the classes. The model calculates a set of parameters for each group that, despite sharing many sociodemographic characteristics, respond to the choice sets in systematically different ways.

Class-specific parameter estimates distinguish each class. In a LC model, the probability that an individual i chooses alternative j in choice situation t follows the typical logit formula but is conditional on that individual belonging to class q ([Hensher et al., 2015](#)):

$$P_{it|q}(j) = \frac{\exp(X'_{it,j} \beta_q)}{\sum_{j=1}^J \exp(X'_{it,j} \beta_q)} \tag{4}$$

where $P_{it|q}$ is the probability that an individual i , conditional on belonging to class q , chooses alternative j from a set of J alternatives, in a particular choice occasion t . Latent class models have been used in previous studies on smallholder preferences for contact attributes within a developing country context ([Gelaw et al., 2016](#); [Van den Broeck et al., 2017](#)) and to explore farmer preferences for cooperatives ([Alho, 2019](#)) and JVs ([Kragt et al., 2019](#)) within developed country contexts.

2.6. The choice experiment

The attributes and levels for the survey were adapted from the review of the literature discussed in Section 2.2, and included the

investment and benefits structure, control rights, quality specifications, price, payments, and cropping decisions. The levels of these attributes were established with the primary goals of being easy to understand and meaningful to farmers. The attributes and their levels are presented in Table 1.

Once attributes and attribute levels were determined, choice sets were constructed with two unlabelled JV scenarios and one opt-out option with levels of all attributes consistent with no involvement in a JV (Table 2). An experimental design was then constructed to create the various attribute profiles and choice sets that were presented to respondents. This is a crucial step in the implementation of a discrete choice experiment because the number of possible choice tasks in an experiment is usually very large; therefore, it is essential to select a reasonable number of meaningful choice tasks (Weber, 2021). The Ngene software (ChoiceMetrics, 2018) was used to determine an efficient survey design. Ngene runs iterations of possible choice sets in an attempt to minimize the error of the design. For this survey, Ngene was run according to D-efficiency, which minimizes

D-errors, or the determinant of the covariance matrix (ChoiceMetrics, 2018). Efficient design aims to reduce standard errors in parameter estimates from the choice experiment data (ChoiceMetrics, 2018). To increase the efficiency of our design, the parameter estimates of the attributes from models in previous literature were obtained (Abebe et al., 2013; Gelaw et al., 2016; Ocheing et al., 2017; Ola and Menapace, 2020a). Parameter estimates were used in the Ngene script to generate choice sets for the study. Ngene generated eighteen choice sets, which were blocked so each farmer had six choice sets to answer.

2.7. Data collection

The study was conducted in the Volta region of Ghana, which is situated in the east of the country and shares a border with the neighbouring francophone country of Togo. A multi-stage sampling approach was used to select farmers for the study (Sekaran and Bougie, 2016). Based on their high yield performance as reported by the Ministry of Food and Agriculture, five districts were purposively selected from the region, namely: Ketu North, Jasikan, Biakoye, Hohoe and Afadjato Municipalities. Three villages were then selected from each district at random: i.e., Avalavi, Afife and kpeyiborkope from Ketu North; Okadjakrom, Jasikan and Atonkor from Jasikan; Vekoloenu, Liati-Soba and Va-Golokuati from Afadjato; Fodome, Ahor and Akpafu from Hohoe; and Bowiri Amanfrom, Bowiri and Worawara from Biakoye. Fifteen farmers were randomly selected from each village except Ketu North where 20 farmers were selected.

In total, 250 smallholder rice farmers were interviewed. Because international travel restrictions were in place during the data collection phase, three enumerators were hired for the data collection process. These enumerators were extension officers working in the selected districts under the local government service. Enumerators were trained on Human Ethics protocols, COVID-19 protocols, and the use of the survey tool (Qualtrics). Responses were collected using mobile tablets with Qualtrics software. These were complemented by hard copy questionnaires in areas where accessing mobile data proved to be a challenge. Later, the completed hard copy questionnaires were inputted into Qualtrics.

Table 3 presents the variable descriptions and descriptive statistics for the sample. As can be seen from the Table, just over 60 per cent of the respondents were male and the average age of the sample was 49 years old. The average size of farm was just under 5 hectares and the vast majority (89 per cent) owned their farm. Eighty per cent of respondents had some form of education but only 38 per cent were educated beyond the primary level. On average respondents had 14 years of rice farming experience and just over half of the respondents belonged to a farm organisation. Many of the respondents (61 per cent) had been involved in some form of rice project. Though a quarter of respondents were not engaged in off-farm work, all households obtained some off-farm income with, on average, this accounting for around 60 per cent of household income.

Table 1
Attributes and attribute levels used in this study.

Attributes	Levels	Hypothesized impact on utility
Investment and benefit structure	No investment for no profits and dividends (Base)	
	20 %- 45 % minimal investment for equivalent profit and dividend	-
	50 %-70 % high investment for equivalent profit and dividend	-
Control rights	Control over decision making in the JV is proportional to investment (Base)	
	Control over decision making in the JV is not proportional to investment (per agreement)	+/-
Quality specification	No compliance with quality standards is required for a 0 % premium price (Base)	
	Compliance with PG quality standards for 10 % premium price (Less strict)	+
	Compliance with JV and PG quality standards for 20 % premium price (Strict)	+
Price system	Producer organisation has a fixed price before planting. (Base)	
	Producer organisation has a flexible price system after planting.	+
Payment	Full payment by cash at the time of delivery (Base)	
	Part-payment by cash before delivery and final payment by cash 2 weeks after delivery	-
Cropping decision rights	Full payment by cash before delivery	+
	Farmers make their cropping decisions (Base)	
	PG and farmer make cropping decisions	+
	PG, SP and farmer makes cropping decisions	-

Table 2
Example of a choice task for this study.

	Option A	Option B	Option C
Investment and benefits	Minimal investment, Minimal benefit	No investment, No benefit	No investment, no profit
Control	Proportional	Not proportional	No control rights arrangement
Quality	Strict standards for 20 %	No compliance	No compliance required
Price	Flexible	Fixed	No pricing system
Payment	Full before delivery	Part before and a part after	Payment at delivery
Cropping decisions	PG, SP, farmers make decisions	PG, farmers make decisions	Farmer makes cropping decisions
Choose your option	○	○	○

Table 3
Variable descriptions and descriptive statistics for the sample (n = 250).

Gender	Categories	Frequency (N = 250)	Percent (%)
	Male	152	61
	Female	98	39
Age	Mean	Minimum	Maximum
	49	24	76
	Minimum	Maximum	Mean
Years in rice farming	2	29	14.4
Years of membership in farmer organization	1	21	9.7
Education	Categories	Frequency (N = 250)	Percent (%)
	No formal education	50	20
	Primary level	95	38
	Secondary school level	70	28
	Tertiary	25	10
Farm Ownership	Categories	Frequency (N = 250)	Percent (%)
	Own farm	243	97.2
	Do not own farm	7	2.8
Source of income	Categories	Frequency (N = 250)	Percent (%)
	Off-farm work	No off-farm work	65
Nature of off-farm work	Off-farm work	185	74
	Farm related	79	42.7
Member of farm organization	Non-farm related	106	57.3
	Categories	Frequency (N = 250)	Percent (%)
Participation in rice project	Yes	131	52.40
	No	119	47.60
Household Head	Categories	Frequency (N = 250)	Percent (%)
	Yes	153	61.20
Farm characteristics	No	97	38.80
	Categories	Male (Frequency)	Female (Frequency)
Farm size (acres)	Yes	145	35
Off- farm income (%)	No	7	63
	Minimum	Maximum	Mean
	0.7	35	4.7
	10	90	60.67

Source: Authors' own calculations.

3. Empirical estimation and results

The multinomial and latent class models for the conceptual joint venture model were estimated using StataBE 17 and NLOGIT 6.0 respectively. Estimation results are shown in Table 4. The superiority of the latent class model, which relaxes the assumption of independence of irrelevant alternatives and allows us to explore preference heterogeneity among smallholder farmers, is confirmed by the results of the likelihood ratio test. The BIC and AIC also indicate that the latent class model fits the data better than the multinomial logit model (Table 4). The final latent class model contained two preference classes, jointly determined by the respondents' choices and the socioeconomic variables included in the class membership function.

All variables were dummy coded to facilitate interpretation of model coefficients (Coffie et al., 2016). The empirical results of the parameter's coefficient, as presented in Table 4, will be discussed within the context of a priori expectation and results from other relevant studies. Although the raw coefficients are difficult to interpret, their sign is meaningful. Farmers prefer an attribute level if the coefficient is positive and statistically significant. In contrast, a statistically significant negative coefficient suggests that the attribute level is not desired. The alternative-specific constant (ASC) was coded 1 for the existing market or status quo alternative and 0 for the JV options. A positive coefficient thus indicates a positive utility associated with maintaining current market conditions.

Table 4
Empirical results.

	MNL	LCM	
Observations	1500	1500	
Log likelihood	−1531	−1086	
AIC	3085	2215	
BIC	3149	2318	
Latent class probabilities		Class 1	Class 2
		45 %	55 %
Variables	Coefficient	Coefficient	Coefficient
Minimal investment minimal profit	−0.2039* (0.1093)	−2.994*** (0.8297)	0.1678 (0.1405)
High investment high profit	−0.5115*** (0.1223)	0.66349 (1.4327)	−0.4238*** (0.1503)
Control rights not proportional	0.3262*** (0.1112)	−0.3478 (0.7116)	0.2761 (0.1730)
Less strict quality specifications	−0.3254*** (0.1257)	1.4195 (0.8902)	−0.6031*** (0.18184)
Strict quality specification	−0.1436 (0.1119)	−2.02120** (1.0007)	−0.0665 (0.1379)
Flexible price system	0.0252 (0.1011)	−0.8382 (0.6689)	0.0595 (0.1435)
Payment before delivery	0.2055* (0.1227)	−2.4783 (1.8301)	0.1864 (0.1689)
Part payment before delivery and final payment by cash two weeks after delivery	−0.1159 (0.1403)	−0.4038 (1.1054)	−0.0581 (0.2111)
PO, SP, and farmer makes cropping decisions	0.2174* (0.1126)	0.9184 (1.3621)	0.0664 (0.1395)
PG and farmer make cropping decisions	0.3104** (0.1214)	3.01827** (0.7302)	0.2209 (0.1531)
ASC	0.4004** (0.1620)	4.3588*** (0.8146)	−1.2417*** (0.2240)
Parameters in class membership function			
Education		−0.9487*** (0.2336)	
Age		0.0461* (0.0238)	
Farm size		0.1845*** (0.0539)	
Ownership of farmland		1.6904 (1.1699)	
Gender		0.0713 (0.4085)	
Farming experience		−0.1219*** (0.0321)	
Contract farming experience		−1.1917** (0.4818)	
Invested in purchasing a processing equipment		−2.0044* (1.0584)	
Entrepreneurial traits		2.1544*** (0.5506)	

Source: Authors' own calculations.

Note: Standard errors are in parenthesis. MNL= multinomial logit model, LCM = Latent class model *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

4. Discussion

The results of the LCM indicate preference heterogeneity among the respondents, particularly with respect to overall preferences for engagement with the JV, investment and benefit level, and quality specification level. The signs of the coefficients on the alternative specific constants indicate that farmers in Class 1 (45 % of the respondents) had a strong preference for their existing market conditions, while farmers in Class 2 preferred the alternatives consistent with a formal joint venture.

The investment and benefit attributes of the JV indicated the level of investment required by each shareholder, which was linked to the profits and dividends to be received from the business. Per *a priori* expectation, our analysis showed JV models with either a minimal or a high-level investment requirement bring disutility despite the potential to achieve high profits and dividends. This result is consistent with Blandon et al. (2009) who found that, ideally, farmers preferred selling into markets that require zero or minimal significant investment relative to high investment. Interestingly, however, the two classes had distinct preferences towards this attribute. Farmers in Class 1 were strongly opposed to even a minimal level of investment while farmers in Class 2 were indifferent towards low levels of investment, but high levels of investment brought disutility. This implies that farmers in Class 1 are less likely to

participate in a JV even if it required only a minimal level of investment while farmers in Class 2 are attracted to the JV options but are less likely to participate if a high level of investment is required.

The control rights attribute of the JV represented the rights between the farmers and their strategic partners to vote and make strategic decisions concerning processing and value-added processes. One level of the attribute specified that these rights are directly proportional to the level of investment by shareholders. The other level specified that these rights are established through an agreement between shareholders, where the initial ratio of equity share is set as the control share so that a subsequent rise or fall in a partner's equity will not affect their control rights. Although the coefficients on this attribute were not significant in the LCM, the results of the multinomial logit model showed that, on average across classes, farmers preferred a model where control rights were not proportional to investment. [Alho \(2019\)](#) explains that farmers are generally against the idea of giving outside investors voting rights in a cooperative as they prefer to restrict ownership and control only to members. Given that farmers prefer a model with zero or only minimal investment, if voting and decision-making rights are proportional to investment, farmers may have no or limited decision-making rights if the strategic partners have a higher shareholding in the business. This explains why farmers prefer a model where control rights are not proportional to investment.

The quality specification attribute specified two levels of quality compliance relative to the base of no quality requirement. One level required that farmers comply with quality standards established by both the strategic partners and directors of the producer groups, in exchange for a 20 % premium price (strict). The other required that members comply with standards established by the producer group for a 10 % premium price (less strict). Our results suggest that the strict quality specification brings a high level of disutility to Class 1 farmers, who generally prefer the status quo, despite the high premium. Class 2 farmers are opposed to the less strict quality specifications for the lower premium while coefficient on the strict quality specification is not significant. This is broadly consistent with results from [Al Ruqishi et al. \(2020\)](#) who found that farmers preferred high-quality specifications to variable specifications, and [Gelaw et al. \(2016\)](#) who found that farmers tended to prefer a strict trader to a non-strict one.

The price at which paddy will be sold to the JV is usually determined by an established agreement in the producer group's supply contract. The levels associated with this attribute suggested that the price can be pre-arranged before planting or harvesting. This, according to the literature, provides a level of guarantee to farmers. However, studies have also found that pre-arranged prices are perceived to be below the actual market price witnessed at the time the product is actually harvested and sold. Therefore, to protect farmers from downward price risks and account for the upward movement in prices post-planting, the JV can have a variable (flexible) pricing mechanism or formula. As the coefficient associated with this variable is insignificant for both classes, results from this analysis suggest that farmers are indifferent to the pricing system. This result contrasts with [Blandon et al. \(2009\)](#), who found that fixing the price with buyers increases the likelihood that farmers will choose a particular market outlet, as it helped reduce the uncertainty associated with future price fluctuations. Indifference towards the pricing system is also inconsistent with [Abebe et al. \(2013\)](#), who determined that farmers are concerned about the possibility of the firm underpaying them once they have agreed to a fixed price contract, and so prefer a situation where the price for their output was able to vary.

The payment attribute described the timing arrangement when paying for the paddy. Results from the MNL model suggest that farmers generally prefer payment before delivery, which is consistent with a priori expectations. This allows the smallholder farmers to cover their cost of production and make provision for their households' needs. The coefficient on the staggered payment schedule indicates disutility but was statistically insignificant across both the MNL and the LC models. Responses to open-ended questions about trust in the value chain indicated that many farmers did not trust their buyers and delayed payment was often the reason given for this lack of trust.

Cropping decision rights describe which party makes decisions regarding the cultivation of the paddy. This includes the planting time, rice variety, fertilizer used, quantity of paddy produced, farming practices, and agrochemicals. In the absence of a JV or contractual arrangement, farmers make these decisions on their own without any consultation. However, as farmers will be working in a formal organization with other farmers and investors under a JV, some cropping practices are likely to change. Results from the MNL suggest that farmers have a stronger preference for making decisions with their producer organization or other farmers, rather than jointly with the strategic partners. This result is particularly relevant for Class 1 farmers, and consistent with a number of previous studies. For example, [Ola and Menapace \(2020a\)](#) found that while smallholders generally prefer to retain control over production decisions, they are about twice as willing to cede decision-making rights to cooperatives compared to buyer firms or NGOs. [Arouna et al. \(2017\)](#) also found that rice farmers disliked a contract where the buyers have control over the production decisions. In addition, [Gelaw et al. \(2016\)](#) highlighted that farmers are more willing to cede control to other farmers because they are perceived to be more trustworthy, and fellow farmers might be a valuable source of information because they are experienced in rice farming.

Several of the studies reviewed above suggest that farmers' participation in marketing activities, particularly integrative business models, tends to be influenced by a range of socio-economic characteristics. To gain a deeper understanding of Ghanaian smallholder rice farmers' inclination to engage in a hypothetical joint venture model, we analysed the underlying factors that shaped their selection of the joint venture attributes. This analysis was conducted using the class membership function within the framework of the latent class model.

The covariates in the class membership function can be interpreted against Class 2 – which is the base class. The probability of a farmer being in Class 1 (those with a preference for current market conditions) increased if they were older and had a larger farm. The probability decreased for those with higher levels of education, more experience with both rice farming and contractual arrangements, and had invested in purchasing processing equipment. Contrary to prior expectations, adopting a new cultivation practice increased the probability of being in Class 1. Since Class 2 is the base for the class membership function, we can infer that farmers in Class 2 are likely to be relatively more educated, younger, have more farming and contracting experience, have smaller farms, have invested in purchasing processing equipment, but have not tried a new production practice.

Conforming to literature and *a priori* expectations, younger farmers with more education were more likely to choose options that were consistent with a JV. The majority of farmers who had a tertiary education level opted for one of the JV alternatives. Conversely, the majority farmers who opted to maintain their current marketing condition either had no formal education or had only a primary or secondary level education. As the age of a farmer increased, they were more likely to opt for the status quo; therefore, their willingness to participate in the JV reduced. This could be because older farmers perceive that they are less likely to fully internalise future returns, profits, and dividends after the company is fully operational. This suggests that younger farmers are more enthused by this model and perhaps more innovative and less averse to trying new concepts. This result aligns with previous studies by Lynch et al. (2018) and Ola and Menapace (2020b), suggesting that younger farmers are more inclined toward inclusive business models, perceiving joint ventures as a means to enhance income and motivation, particularly as they start their farming ventures.

In contrast to previous expectation, farmers are more likely to be in Class 1 as they expand their farm size. It is likely that smallholders are interested in participating in the JV because of the prospects that the JV would improve their farm business. On one hand, relatively large-scale farmers are perhaps, more resistant to the idea because they would like to have more control over their farm activities and perceive that their stake in the JV might be intrinsically lower, resulting in their loss of control (Liang and Hendrikse, 2013). It is also possible that they believe they have sufficient scale to be able to market their product effectively. They could have farm assets, better incomes, and are probably self-sufficient. Also, considering that farming requires a significant amount of money, large-scale producers may have already invested a considerable amount in their farm and therefore, are not interested in investing in another venture.

According to the investigation, farmers with more experience in rice production and contractual arrangements were more likely to be in Class 2, and thus, they were more likely to choose a non-status quo option. More experience in rice farming likely exposes farmers to various types of model structures such as contractual arrangements, collective marketing, cooperatives, rice development projects, and other initiatives or policy structures that either benefit them or educate them. Successful or unsuccessful they tend to learn from their experience and are more capable of handling situations, better at solving problems; therefore, they might be in a better position to take on and apply these experiences to new opportunities.

It was expected that farmers with contracting experience would be attracted to the JV alternatives because contract farming is another form of IBM and previous experience with it indicates that farmers would be familiar with its institutional arrangements and would be more confident joining a business that has relatively similar concepts and characteristics. Contract farming has been claimed to have a positive impact on local economies by improving the welfare of rural households (Bellemare, 2010, 2012; Barrett et al., 2012) and this might also be the reason why farmers are inclined to opt for this new opportunity. Though it should be noted that the overall effect of contracts on household welfare is uncertain (Bellemare and Bloem, 2018; Ruml and Qaim, 2021).

A variable measuring farmers' entrepreneurial traits was also used in the class membership function. Farmers who had invested in purchasing processing equipment were more likely to be in Class 2, indicating that they were relatively more likely to participate in a JV. In addition, farmers who had tried a new activity on their farm in the last five years were expected to be willing to try the JV concept. However, in contrast to this *a priori* expectation, farmers who adopted a new cultivation practice on their farms were more likely to be in Class 1. The majority of farmers who were entrepreneurial either planted a new crop variety, applied a new type of fertilizer or agrochemical, or used a power tiller. All these new things are production-related activities and explain why the farmers' focus and investments towards production might reduce their consideration for processing their rice and therefore, their interest in a JV.

5. Conclusions, policy implications and study limitations

In this study, we aimed to explore farmers' preferences for JV model attributes, assess the proportion of the smallholders interested in such a model, and identify socioeconomic factors associated with their willingness to participate. As JV structures are not widely adopted within the farm business community, particularly in Ghana, farmer preferences for these models and their attributes were not well understood. We used a desktop literature review to identify the main attributes of institutional arrangements that have facilitated value adding and access to markets for smallholders in developing countries and to determine how previous researchers have specified and measured these attributes for choice experiments. Informed by the literature, the attributes of a hypothetical JV model were explicitly identified and defined. A discrete choice experiment incorporating the attributes was then used to determine smallholder rice farmers' preferences for the attributes of a JV model. The attributes in the DCE were kept simple to reduce the cognitive burden on the respondents but also to keep the focus on the key elements the JV model represents. As the first application of a DCE to determining smallholder preferences for a JV in Ghana, this study represents a substantial contribution to the literature.

Methodologically, the findings of the paper contribute to the choice modelling literature by providing evidence on the usefulness of the latent class model in revealing smallholder farmer preferences towards various attributes of inclusive business models within a developing country context. The modelling of heterogeneity in two distinct classes has the advantage of gaining easily interpretable results for policymakers. The potential next step in practice is to tailor the combinations of farmers' preferred attributes into business models that seek to move farmers up a level in the value chain process.

Consistent with previous studies, our results suggest that a high investment requirement brings disutility to potential JV participants. Unfortunately, JV structures are capital intensive. Although this is not promising for establishing a JV, a few studies have shown ways in which inclusive business models can be financed. Blended finance refers to the use of grants (or grant-equivalent instruments) in conjunction with non-grant financing from private and/or public sources to provide funding on terms that make projects financially feasible and/or sustainable for the smallholders (Mustapha et al., 2014). Grants are transfers made in cash, goods, or services for which no repayment from the recipient is required. Vermeulen and Cotula's (2010) analysis of JV structures in several countries showed that

these models were proactively led by the host country government.

Within the current context, several policy implications emerge. The Ghanaian government, through its development projects, could consider supporting smallholders by providing grants to serve as their equity to be invested in the JV. The government can also encourage collaboration between financial institutions and NGOs by mediating, negotiating, and leveraging capital using grants. The government can also implement policies that will educate and increase farmers' knowledge on adequate post-harvest and processing activities and will also increase their involvement in processing activities and post-harvest techniques. Because younger farmers with prior experience contract selling are already positively predisposed to participating in a JV, our findings suggest that targeting the educational efforts towards older less educated individuals with larger farms and less experience with farming and contractual arrangements may be fruitful. Overall, the results of this study are encouraging for the introduction of a joint venture structure in Ghana. While the topic was new to the farmers at the time of the survey, the respondents showed considerable interest in the JV attributes.

One notable limitation of this study relates to the definition of attribute levels and alternatives used within the study. To minimise the cognitive burden and possible negative impact of interviewee fatigue associated with the choice experiment, some attributes had to be bundled together. For example, the investment and benefits attributes and the quality specification and price premium attributes. However, this does mean it was not possible to consider changes in the levels of these attributes individually which may have given further insight into the preferences of the respondents. In future work, these attributes could be identified individually (i.e., as an investment attribute, benefit attribute, quality specification attribute, and premium price attribute). This will help to efficiently estimate farmers' trade-offs, for example, in the absence of a benefit component.

Also due to time and financial constraints, the research was limited to a relatively small sample size in Ghana. While the findings provide valuable insights into the preferences and behaviors of this specific group, the limited sample size may constrain the generalizability of the results to a broader population. Further research could utilise a larger sample size across other regions to obtain a more robust choice model. As a JV is a partnership between various actors, further research could investigate the willingness of the other partners to participate in the JV model by using a DCE for example, to also elicit their preference for attributes of the JV.

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