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SOCIOLOGY | RESEARCH ARTICLE

Constrained crop enterprise choices by smallholder farmers in semi-arid Zimbabwe

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Abstract: Smallholder irrigation schemes are critical in sustaining livelihoods of communities in the drier areas of Zimbabwe. The performance of these schemes as food and incomes safety nets has been questionable over recent times. Using a multinomial logit model, the study examines factors affecting smallholder irrigation farmers' selection of crop enterprises in their crop mix decisions. The paper uses cross-sectional data from 136 small holder irrigation farmers at Nharira irrigation scheme in Bikita district of Zimbabwe. A self-administered questionnaire, which was supported by key informant interviews, was used for collecting primary data on crops produced, sales made and specific household variables such as incomes and age of principal decision makers. Secondary data on contested variables such as sales and incomes were referenced. The data shows that the age of household head, association to membership groups, number of buyers available in the markets and the prices of respective crops significantly (p < 0.05) affects the choice of enterprises. The results also show that small scale irrigation farmers' decision making is constrained by lack of effective information dissemination mechanisms

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PUBLIC INTEREST STATEMENT

Small scale irrigation has the potential to sustain livelihoods especially in the semi-arid and arid zones among smallholder farmers who are usually resource constrained. Produce from irrigation schemes contribute significantly to food security and income generation capacities of households. Marketing of agricultural produce from small scale irrigation schemes of Zimbabwe remains critical in attaining the aforementioned benefits. Without appropriate crop selection and marketing strategies, smallholder farmers will remain alienated from lucrative and rewarding marketing channels. The study outlined in this paper, therefore, examined how smallholder farmers in Bikita district of Zimbabwe make crop enterprise choice decisions as influenced by their internal and external conditions. A key finding from the study was that the market conditions have a significant bearing on the choices made by farmers. The study also revealed that the number of buyers in the markets is also an important determinant. These findings point towards the need for policy re-orientation towards supporting targeted small scale irrigation management committees for information generation and dissemination.

and weak core competencies of market signals interpretation among farmers. Stakeholders suggested the need to strengthen access to rewarding markets through decentralising marketing points. This can be sustained by information centers in their localities so as to harness from beneficial market information, which will in turn have a significant impact on how crop choice decisions are made.

Subjects: Sociology & Social Policy; Rural Development; Political Economy

Keywords: Irrigation schemes; smallholder farmers; crop choices; extension networks; multinomial logit

1. Introduction

1.1. Background and context

Smallholder irrigation schemes have the potential to boost local and national social and economic development (Makombe & Sampath, 1998; Woodhouse et al., 2017). The choice of appropriate crops enterprises has significantly limited the scope for welfare gains from smallholder irrigation schemes. Globally, smallholder irrigation systems are viewed as critical resources that are needed to increase crop-water supply and sustain livelihoods in the semi-arid regions (Nhundu & Mushunje, 2010). Unfortunately, throughout Africa, there are limited cases of successful and sustainable farmer-managed smallholder irrigation schemes despite interventions by governments, non-Governmental Organizations (NGOs) and private organizations (WORLD BANK, 2008). Smallholder irrigation schemes in southern Africa, Zimbabwe, included have largely failed in their core objective of improving rural livelihoods and sustainable crop production for food security and poverty alleviation (RUKUNI et al., 2006). Barriers to productivity in global smallholder farming include inadequate appropriate inputs (e.g., high yielding varieties and inorganic fertilisers), inaccessible and congested markets, unreliable and inadequate water delivery and government policies on land tenure that do not support a conducive environment for the successful operation of irrigation schemes (AKUDUGU, 2013; Mutambara & Munodawafa, 2014). As alluded to by MUTIRO and LAUTZE (2015), the most dominant crops in most government owned irrigation schemes have tended to be cereal crops including maize and wheat which targeted food security concerns of the country. However, the offtake of public-private partnerships has also brought on board cash crops such as soya beans, carrots and paprika. However, maize still dominates in the form of grain maize and green mealies.

Zabel et al. (2014) and Manzungu and Van Der Zaag (1996) report that, compounding this, additional multiple challenges are directly experienced by the smallholder farmers in their efforts to attain reasonable profit margins from agricultural activities. These include poor storage facilities, limited access to production factors, biased extension services and unhealthy competition in limited product markets (MUTIRO & LAUTZE, 2015). As alluded to by VANROOYEN et al. (2017), this has been the case of irrigation schemes where farmers were not getting adequate cross cutting support, but rather get minimal strategic advice in terms of productivity enhancing mechanisms and market information. Despite the apparent benefits that the country and farmers have enjoyed from irrigation schemes in most parts of southern Africa, smallholder irrigation schemes have proved to be unsustainable beyond external support (WENHOLD et al., 20074), with for example, most irrigation schemes in southern Africa having not been self-sustaining (Chazovachii, 2013). Currently, the Food and Agriculture Organisation of the United Nations (FAO) is rehabilitating 14 irrigation schemes and some have been established in the 1980s The pattern with these irrigation schemes has been that every five years new donor funded programme is adopted to rehabilitate irrigation infrastructure (IFAD, 2020). This is a red signal that points towards the inability of farmers to maintain their own irrigation infrastructure. The consequence is that the schemes have to date been characterized by low production and minimal direct contribution to the national economies (Pittock et al., 2020).

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Low production have mainly been attributed to minimal support by the government to make sure farmers in irrigation schemes get access to inputs and investment loans (BJORNLUND et al., 2017; Rukuni, 1988). Additionally, in south East Africa, for example, ABEBE et al. (2020) also reported that most commercial banks have stopped to extend loans to smallholder irrigation schemes, due to collateral issues, this further compromising their infrastructure development projects. They further observed that even though the government has made some efforts to allow micro finance institutions to support smallholder farmers, the uptake for their loans have been minimal due to the fact that their loans have high interest rates, which makes it not viable for most crops smallholder farmers grow in irrigation schemes. Unsurprisingly, the smallholder farmers do not seem to appreciate and benefit from the socio-economic value generated by these irrigation schemes (Woodhouse et al., 2017). In an effort to cushion themselves against these signals of underperformance, the farmers in the irrigation schemes have in some cases entered into contracts with private sector companies like Cashel Valley Pvt Ltd., Klein Karoo and Zimbabwe Super Seeds for sugar bean seed particularly in Bikita District. These contractual opportunities have opened up avenues for the smallholder farmers to gain strides in food and income security due to easier access to reliable input and output markets. Of concern however is that due to the demands of the contractors, crops such as maize, sugar beans, cabbages and onion continue to dominate production cycles in most smallholder irrigation schemes (Pittock et al., 2020). This has crowded out other potentially viable enterprises and value chain actors and as such, the competitiveness of Nharira irrigation scheme, as is the case with most smallholder irrigation schemes remains questionable today and into the foreseeable future. UNDP (2012) notes that of fundamental concern are issues related to the institutional failure emanating from dysfunctional Irrigation Management Committees, weak networks with marketing channel players, deteriorating infrastructure and limited financing options.

Approximately 70% of the rural African population lives in poverty and depend mostly on smallholder agriculture for their livelihoods (Fanadzo et al., 2010). There is a research gap in understanding the determinants of crop choices among resource constrained smallholder irrigation farmers who have limited access to markets, finances, management skills and infrastructure (Rattan, 2015). As observed by ABEBE et al. (2020), this dimension of enhancing competitiveness in smallholder irrigation schemes has not received direct research attention in the recent past. The immediate benefit of the study is that, based on the information generated, it will give insights into possible viable crop enterprises into smallholder farmers in irrigation schemes can participate while realizing acceptable profit margins. This is important because knowledge on these preferred enterprises will make it possible for farmers to continue growing crops and at the same time be able to maintain their irrigation infrastructure (Deison & Manona, 2007). Irrigation development practitioners will also be re-directed in terms of the crops which they need to support across different spatial and temporal scale, based on their competitiveness (MUTENJE et al., 2010).

Abrams (2018) observes that globally, several neglected and underutilized species such as traditional grains have the scope to provide long-term solutions to climate change and sustaining food security. However, their inclusion in mainstream cropping plans has been affected by the same aforementioned factors. De La Hey and BEINART (2017) also alludes to that notion and reports that in South Africa, most smallholder farmers have become accustomed to underutilising arable lands, thus further crowding out these marginalised crops. This, according to CHIVENGE et al. (2015) has open up avenues for perpetual food and income insecurity in these communities. Interestingly, MABHAUDHI et al. (2016) identified numerous opportunities for the underutilized crops in emerging value chains such as energy and health. They contend that, for these untapped options to be unlocked, there is need for capacity building programs in the localities of the farmers as well as institutional support which should then sustain the multi-objective nature of the new marketing channels and production systems. WENHOLD et al. (2007) however posits that the success of new cropping patterns can only be possible if the smallholder farmers are linked to reliable sources of water. This was supported by Chimonyo et al. (2016) in an intercropping system which accommodated the traditional alienated crops such as sorghum and cowpea. These

conflicting findings in literature therefore present opportunities for realigning the current crop choice strategies among smallholder farmers.

Persistently, there has been an observed pattern where smallholder irrigation farmers get unsustainable profits from value chains in which they participate (BJORNLUND et al., 2017) . Key questions emerge on the fundamental drivers which have sustained this position over time regardless of efforts by private and public stakeholders to support the smallholder farmers. It therefore becomes unavoidable to closely examine these determinants at this stage of the agribusiness development drive where small holder irrigation schemes can be a critical source of produce for multiple markets. This study is therefore aimed at unravelling the factors influencing the crop choices in smallholder irrigation schemes with the hope of helping redesigning extension systems to be responsive to the challenges faced by these farmers.

2. Methods

2.1. Description of the study area
The study was conducted at Nharira irrigation scheme which is in Bikita district about 85 kilo-metres from Masvingo town along Mutare highway. According to IFAD (2020), the scheme has been fully functional since 2015 after a rehabilitation program funded by government of Switzerland and facilitated by the Food and Agricultural Organisation of the United Nations (FAO). IFAD (2020) further reports that management of the activities is done by different sub-committees which fall under the Irrigation Management Committees (IMCs), namely, marketing committee, water management and maintenance committee. Farmers are contracted to produce among other crops such as maize under the import substitution programme sponsored by the government of Zimbabwe and sugar beans by private companies. This smallholder irrigation scheme is located in Natural Region V and is characterized by low rainfall averaging less than 450 mm per annum, which is often erratic and not adequate for crop production (Mutami, 2015). Bikita district is located at −20.08422° N, 31.61382° E. The area lies at an average elevation of 656 m. The dominant type of soils is typically sandy clay loamy and is favourable for production of most crops including maize, sugar beans, carrots, tomatoes and onions. However, the latter crops including carrots and onions are not actively produced in the irrigation scheme since contractors do not support these crops and farmers are sceptical of possible production and market related risks associated with the crops.

2.2. Data collection procedures
Guided by IFAD (2020), the irrigation scheme was selected purposively as it is a success case of the smallholder irrigation schemes rehabilitation programme in the Lowveld of Zimbabwe. A total of 136 farmers made up of 60 males and 76 females make up the scheme with each farmer allocated an average of 0.4 hectares on a perpetual basis. In this case a census design was adopted for sampling. Data on the crops grown, the markets used and household attributes were collected using a structured questionnaire with triangulation of the data done using Focus Group Discussions (FGDs).

2.3. Conceptual framework for crop choices
The study focuses follows the optimisation of utility framework to determine the critical factors which influence crop choices by smallholder irrigation farmers. The study defines choice as a decision by the farmer to allocate land to a particular crop during the review period. This study agrees with the observations made by the WORLD BANK (2008) that smallholder farming communities experience multiple challenges in determining what to produce and how much to produce. These drivers exerts additional pressure on the principal decision makers who already have limited resources at their disposal (UNDP, 2012). The utility optimisation argument was successfully used in studies e.g., by Musemwa et al. (2007) to explain decision making and risk management strategies by farmers. Since small holder irrigation farmers in Nharira irrigation scheme face similar obstacles the study borrows from the same ideology (utility optimisation).

The utility maximization concept presents a case where when a rational decision maker selects an option among many alternatives, their goal is to get the greatest value out of the decision. In the study, an adopter will expect to get higher returns in terms of margins from particular crop enterprises, either in isolation or as combinations. Given the multinomial nature of the choices at the farmers' disposal, the multinomial logit model was selected for modelling the choice making processes. Informed by MAZVIMAVI and TWOMLOW (2009) the study assumed that for any farmer in the irrigation scheme, the demand for a particular crop enterprise can be modelled as:

$$ATET = E(Y_1 - Y_0 | X, \ C = 1) \tag{1}$$

Where, X_i = the determinants of choosing a particular crop enterprise; β = the parameter estimate; and μ = the error term. Following the model in (1) above, the actual demand for the crop enterprise by the farmer is given as:

$$ATET = E(Y_1 | P(X), P = 1) - E(Y_0 | P(X), P = 1) = \alpha \tag{2}$$

The probability that a household will effectively choose an enterprise is given based on the utility maximisation motivation. This implies that the farmer will only select an enterprise if there is a positive utility difference between the selection and non-selection options.

2.4. Empirical modelling

Most choice based studies have used the multinomial logit regression option given its ability to capture both the individual and alternative choices. Guided by Mango et al. (2014), who also reported the ability of the multinomial model to account for potential self-selection bias and interaction among the alternatives, the study used this model. This facilitated the analysis of the three possible choices at the farmers' disposal being maize, sugar beans and green mealies and determines how each variable affected the particular choice. These crops are the major crops in the irrigation scheme and are the ones supported by the seed houses and contracting companies. The study agrees that rationality of decision making units in households will force them to consider and choose an alternative which, subject to a number of constraints, will optimise their utility. As such, the latent utility (U) of a decision maker i making a choice j is given as:

$$U_{ij} = \beta' X_{ij} + \varepsilon_{ij} i \in N, \ j \in J \tag{3}$$

In this case, we note that X contains features of the enterprise choice, j and the individual, i. Given the diversity and variations among the households across multiple factors such as income and extension services, the households will be exposed to different crop enterprises for them to choose from. Also basing on the utility optimization assumption presented above, the probability of an irrigation farmer to choose a particular crop enterprise among the three alternatives available is expressed as:

$$P(c_i = \ j) = \ P\left(U_{ij} > \max_{k \neq j}\{U_{ik}\} \right) \tag{4}$$

The crop choice decision, d_{ij} is the variable showing the crop choice (1) or no-choice (0) possibilities for each enterprise and individual farmer:

$$d_{ij} = \begin{cases} 1 \ if \ U_{ij} \geq 0 \Leftrightarrow \beta' X_{ij} \geq -\varepsilon_{ij} \\ 0 \ if \ U_{ij} < 0 \Leftrightarrow \beta' X_{ij} < -\varepsilon_{ij} \end{cases} . \tag{5}$$

3. Results and discussion

A descriptive presentation of explanatory variables included in the model is as in Table 1. The mean values are computed for the whole sample of respondents.

Table 1 shows that the mean age for the principal decision maker in the study area was about 33 years while the average land size outside the irrigation scheme was about 5 ha. This shows that the farmers had other land which they needed to crop besides their irrigation plot and as such also needed to commit resources. The price for sugar beans was almost three times that of maize grain in the sampled markets.

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Table 1. Summary of explanatory variables used in the multinomial model		
Variable	**Description**	**Total sample mean**
AGE	Principal decision maker's age in years	32.53 (1.235)
LANDSIZE	Size of arable dry-land holding in hectares	5.083 (0.117)
AHHLDSIZE	Number of active family members for labour	3.115 (0.023)
$PRICE\_M_g$	Average weighted price of grain maize in US$/kg	2.633 (0.173)
PRICE_S	Average weighted price of sugar beans in US$/kg	6.124 (1.983)
$PRICE\_G_m$	Average weighted price of green mealies in US$/cob	0.891 (0.527)
MEMBERSHIP	Number of social groups by members	2.336 (1.284)
MARKETDST	Distance to the chosen product market	5.631 (1.385)
EXTENSION	Frequency of extension contact per week	6.895 (2.007)
LOG_OFINC	Proportion of off farm income as a %	63.58 (5.008)
EXPERIENCE	Period farmer has been in the irrigation scheme in years	9.562 (1.346)
BYNUMBER	Number of consistent buyers in the market	5.892 (1.006)

Source: Generated by authors. Standard deviations are in parentheses

On average, farmer travelled about 5.6 km to their preferred marker and had access to extension services on average 7 times a week. The distance was relatively far given the prevailing modes of transport in the study area. However, the extension contacts per week was higher that the 3 times per week reported by Mutami (2015) in similar conditions of Zimbabwe. The same cannot be said for the average number of buyers in the preferred market which averages 6 buyers in the study area but averages 12 buyers in Ghana as reported by AKUDUGU (2013). About 64% of the sampled households' income is generated from non-farm activities. A similar pattern where irrigation farmers are more reliant on off-farm activities for income is reported by Fanadzo et al. (2010) in Zanyokwe irrigation scheme.

Results of the multinomial logit regression for the choices of enterprises are presented in Table 2. According to Baum (2006), higher values of the regression coefficients and the z-value are more desirable since these show the potential of the variable to contribute in explaining the variation in the dependent variable. Since the grain maize crop was used as the reference (base) crop, all the interpretations for the other two crops were done relative to the grain maize choice.

The base crop is grain maize. Standard deviations are in parentheses. *; ** and *** shows p-values significant at 1%, 5% and 10% levels respectively.

Of the 12 variables captured in the analyses, seven variables, namely, age of principal decision maker, average weighted price of sugar beans, number of social groups by members, distance to the chosen product market, frequency of extension contact per week and proportion of off farm income significantly ($p < 0.05$) influenced the farmer's decision to choose sugar beans over maize. Five variables namely age of principal decision maker, average weighted price of grain maize, average weighted price of green mealies, number of social groups by members and proportion of off farm income had a significant ($p < 0.05$) influence on the green maize choice over grain maize.

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Table 2. Multinomial model estimates for crop choice decisions				
Variable	**Crop choice**			
	Sugar beans		**Green mealies**	
	Coefficient	**z-value**	**Coefficient**	**z-value**
AGE	−1.964 (0.539)	−3.644*	−1.630 (0.683)	−2.387*
LANDSIZE	0.039 (0.127)	0.307	0.087 (1.239)	0.070
AHHLDSIZE	1.850 (2.396)	0.772	0.788 (1.058)	0.745
PRICE_M_g	−0.971 (1.036)	−0.937	1.875 (0.335)	2.612***
PRICE_S	2.164 (0.618)	9.111*	−0.551 (0.969)	−0.569
PRICE_G_m	−0.117 (0.271)	0.355	0.925 (0.128)	7.188*
MEMBERSHIP	2.446 (1.162)	2.105*	1.566 (1.003)	1.560**
MARKETDST	−1.619 (0.718)	−2.255*	−0.359 (1.851)	−0.194
EXTENSION	1.603 (1.222)	1.312**	0.021 (0.068)	0.309
LOG_OFINC	−1.941 (1.143)	−0.823***	−1.196 (0.364)	−0.537***
EXPERIENCE	0.331 (0.489)	0.677	0.895 (1.280)	0.695
BYNUMBER	1.248 (0.375)	3.307*	−0.682 (2.026)	−0.337
CONSTANT	0.327 (1.236)	0.265	0.163 (0.198)	0.823
Number of observations 136				
Log pseudo-likelihood −91.9956				
Pseudo R-square 0.3362				
Wald chi-square 32.75**				

Results from Table 2 show that household specific variables (e.g., age of principal decision maker and proportion of off farm income), market conditions (e.g., distance to the chosen product market and average weighted price of grain maize, sugar beans and maize grain) and institutional factors (e.g., frequency of extension contact per week and number of social groups by members) affect the decision to choose a particular crop enterprise by the smallholder irrigation farmers.

3.1. Age of principal decision maker

From the above analysis the results showed that age of the principal decision maker in the household had a negative and significant ($p < 0.05$) influence on the choice of sugar beans and green mealies over the maize grain. This implies that as the age of the decision maker increases, farmers tend to prefer maize grain over the other two crop enterprises. Due to the land limitations in the smallholder sector globally, a similar pattern was observed by Mango et al. (2014) in a food security study when they argued that the reason maybe that the younger farmers are more innovative and interested in trying new crop enterprises as they emerge and also use new methods of producing the cash crops so as to boost their food security and income levels. From a theoretical orientation, these farmers are mainly then concerned about the returns to investments when they make the crop choices. BJORNLUND et al. (2017) noted that farmers feel that due to the maize grain's lower market prices, they will increase their aggregate incomes from producing more of the cash crops such as sugar beans and market them in rewarding markets. This will sustain competitive edge in selected value chains of choice as guided by the risk optimisation philosophy also reported by Zabel et al. (2014). There is also the same mentality in the study area that maize grain is re-emerging as yet another '*poor man's crop*' due to the relatively lower market prices.

MUTIRO and LAUTZE (2015) reported that discussions with key informants showed that the younger farmers would traditionally opt for horticulture related crops which are offered by the NGOs driven development projects since these are considered high value crops. Additionally, due to the market signals which show lower market prices for traditional maize grain, younger farmers

are emerging as the most active in the cash crop enterprises such as green maize and sugar beans. Guided by the resource substitution theory in an environment of scarcity, De La Hey and BEINART (2017) and Scoones et al. (2011) also reported that in the drier parts of South Africa, older farmers are more inclined towards traditional cereal crops such as maize grain since they are more concerned with household food security as their immediate priority. The unwillingness to take advantage of emerging innovations in cropping systems has therefore increased the transaction costs of most small scale farmers as alluded by Chimonyo et al. (2016). This also explains the observed variation by age of the decision making household head.

3.2. Market prices for the respective crops and household incomes

Results from Table 2 show that relative to the maize grain, as the prices of the selected crop in the markets increase, the likelihood of farmers taking a decision to produce that particular crop also increases. Informed by the neo-classical economic theory and the empirical findings from a study by WENHOLD et al. (2007) if market prices are unfavourable, then small scale irrigation farmers will increase their chances of getting significant financial returns from the enterprise. Theoretically, market prices are a critical consideration when farmers decide on crop choices in irrigation schemes (RUKUNI et al., 2006). The result of this study confirms the hypothesis that the prices of commodities in markets positively influence farmers to produce more of a commodity in any given market *ceteris paribus* as put forward by Pittock et al. (2020). Table 1 shows that the prices of the chosen crop enterprise are not comparable with those of the non-selected crops and hence there is motivation to migrate towards the more rewarding crops in production plans by the smallholder farmers as they attempt to enhance income security.

Results from Table 2 show that as the proportion of household income from non-farm activities increases, the chances of the household choosing the sugar bean and green mealies over maize grain decrease (the regression coefficients are both negative). AKUDUGU (2013) reported that in such cases, farmers with higher levels of household income from non-farm activities are less likely to be concerned with the income benefits from the cash crops since they have a leverage from other alternative sources. De La Hey and BEINART (2017) put forward the argument that, the multi-objective nature of smallholder farming environments demand this kind of resources allocation decision frameworks. Household incomes from non-farm sources are also reported as an important determinant of the innovation adoption decision making process (Deison & Manona, 2007). This view point is further supported by UNDP (2012) by arguing that, since agricultural activities are seasonal and risky, farmers are more likely to take up crops and production systems which increase their socio-economic sustainability such as maize grain which can enhance food and income security simultaneously. The same intuition was also postulated by Abrams (2018) in their argument for designing strategies towards tapping into dry-land agricultural activities among smallholder farmers using heritage based options. This is greatly grounded in the risk management theoretical lenses which have sustained the success of strategic value chains as reported by Woodhouse et al. (207). The argument is sustained by the global patterns of information flow which catalyses the choice of highly rewarding crop enterprises by farmers.

3.3. Distance to markets and number of buyers

Distance was measured by the kilometres travelled to reach the nearest and most preferred market outlet for the chosen crop. From the results in Table 2, distance to market has a negative and significant ($p < 0.05$) influence on the selection of sugar beans over maize grain. MUTENJE et al. (2010) also reported that the longer the distance to the market the less the likelihood of demanding the cash crop option since farmers feel they will not have chances of reaching the rewarding markets at low transaction costs. Guided by the fundamental transaction costs theory, because of longer average distances to most lucrative markets for sugar beans in the study area, farmers are forced to remain locked in their traditional maize grain whose markets are relatively easily accessed from Grain Marketing Board depots and the inputs from government subsidy programmes. In this regard, distance to the market increases the transaction costs (MABHAUDHI et al., 2016) of accessing sugar beans buyers thereby discouraging the utilisation

of certain sugar bean marketing channels. The dynamics of marketing channel access are also of profound importance across numerous other crops globally as reported by Pittock et al. (2020).

The number of sugar bean buyers accessible to the irrigation farmers has a positive and significant (p < 0.01) influence on the chances of farmers selecting the crop over maize grain. These smallholder farmers' decisions are fundamentally guided by the structure, conduct and performance of these markets when they make production decisions (CHIVENGE et al., 2015). The immediate benefit of having many buyers in markets is observed when there is healthy competition such as in the case of free market systems which ultimately increases pricing efficiency. Farmers reported that whenever more buyers came into the area, the prices of the sugar beans would start to increase due to the competition among buyers. Nhundu and Mushunje (2010) reported that, more buyers of sugar beans mean that more of the product is bought from the farmers in multiple market outlets including roadside vendors, small local retailers and larger contractors. The argument is that, this greatly improves availability and access to the markets by the smallholder irrigation farmers (BJORNLUND et al., 2017).

3.4. Assistance from extension officers and membership to social groups

Results from Table 2 show that the likelihood of choosing sugar beans and green mealies over maize grain increases as the frequency of extension contacts increase. Increased frequency of contact with extension agents should increase the chances of accessing reliable information about emerging and more rewarding production innovations for particular cash crops (e.g., sugar beans) which are emerging. This finding is consistent with a study by AMARE et al. (2012) in maize-cowpeas farming in Tanzania where extension services had a positive implication on the choices of the integrated cropping systems. VANROOYEN et al. (2017) also argue that extension services are an important strategy in supporting and sustaining production and marketing information systems within smallholder irrigation farming communities. This is especially so in the small holder set ups where extension officers remain the most reliable source of the information. These notions are grounded on the systems theory of agricultural development which advocates for information generation and sharing among value chain stakeholders. BJORNLUND et al. (2017) reported positive profitability patterns for the farmers who are networked, not only to the extension agents but also to other value chain stakeholders.

Membership to social groups by household members had a positive and significant (p < 0.05) influence on the likelihood of farmers choosing sugar beans and green mealies over maize grain in the irrigation scheme. RUKUNI et al. (2006) also supports this and reports that in most African small-scale setups, farmers are more likely to have access to extension services and knowledge when they are part of social membership associations. The main social associations to which household members subscribed to in the study area included farmer groups, church groups and general social groups. Guided by the social networking philosophy, the interactions on these various group platforms enabled farmers to educate each other about innovative production, marketing and negotiation practices. Farmers and key informants however noted that extension services are often directed towards farmers who are wealthier and more likely to have chances of taking up the emerging innovations such as sugar beans production. This inequality in the distribution of resources is linked with production inefficiency and limited control of important agricultural resources which manifests and is sustained in small scale irrigation farming zones (Chazovachii, 2013).

4. Conclusions and implications for policy

Based on the results, the study can conclude that, crop choices are mainly influenced by household specific (age of decision maker, household income), market (distance to the market, number of buyers in the markets, market prices) and institutional (extension services and membership arrangements) factors. These patterns were also reported by BJORNLUND et al. (2017) and WENHOLD et al. (2007). However, De La Hey and BEINART (2017) noted that critical factors revolve around government policies and partnerships with the private sector along value chain activity nodes. Based on the study findings, the value chain stakeholders are advised to identify and support extension-based low cost information platforms such as social groups which link farmers

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to sources of information. There is need for reinforcing extension towards informed re-allocation of land towards more rewarding crops as guided by market signals such as the relative prices and distances to markets. In this vain, extension agents are advised to continuously offer training on core competencies such as market buyers' location information search at various times of the season and interpretation of market data such as market price variability by the smallholder irrigation farmers. The benefit is that, these interactive networks will facilitate change in multiple production and marketing decision making processes. It is also suggested that, the government needs to put in place policy frameworks which encourage the decentralizing of formal markets so as to reduce the risks of market related losses which seem to be dominant in the study area due to relatively long distances and limited number of buyers who are active mostly in informal markets. This should significantly reduce the transaction costs across multiple marketing channels, thus giving the farmers alternatives to market their produce profitably.

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