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The Socio-economic Determinants contributing to the Resolution on Commercialising Vegetable Production: The case of White River, South Africa

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Abstract

The study looked at the socioeconomic connections and determining elements that affect choices on whether to commercialise vegetable farming. The study was carried out at White River, Mpumalanga, South Africa, using 660 participants who were specifically chosen. The level of commercialisation was analysed by applying the household commercialisation index calculated as the ratio of value of marketed output to the value of vegetables produced. The factors affecting the marketing of vegetables in the region were then determined using descriptive statistics and logistics regression. The extent of vegetable commercialisation result

indicated that spinach and cabbage was ranked 1st and 2nd respectively. Although the commercialisation index is not high, latent evidence exists showing that lettuce, cucumber, beetroot, and carrot are in high demand for consumption and intention to commercialise was indecisive. Applying the logit model, the significant variables influencing the commercialisation of vegetable production in the area were gender, level of education, marital status, household size, extension services, agricultural inputs, and storage facilities. The paper concludes that commercialising vegetable cultivation is a key step toward a broader economic reform and poverty reduction. To enhance vegetable cultivation in the area, farmers must be encouraged to transition to output that is market oriented.

Keywords: *Extent; Food security; Households; Index; Ratio; Factor; Market-oriented, Marketed value.*

1. Introduction

The tradition of cultivating vegetables in backyard vegetable gardens dates back to small parcels of land used for subsistence farming near homes. Home gardens include a mixed cropping pattern that includes ornamental, medicinal, and plantation crops in addition to vegetables, fruits, spices, and herbs (Galhena, Freed and Maredia 2013). Whereas some resemblances exist in home garden, each home garden activities are exceptional in structure, purpose, arrangement, and appearance because the practice depend on the location, labour availability, skills, taste, and interest of households.

The household's financial requirements and consumption needs determine the crop choices, input purchases, management system, insect control, weeding, and other gardening techniques. Multiple socio-economic benefits of home gardens exist which include enhancing food security, improving family health and empowering women, promotion and preserving indigenous knowledge and culture through the cultivation of local spices. Home gardens support South Africa's food security and subsistence by helping to generate revenue for the vast majority of resource-poor families. According to studies, home gardens enhance rural income, economic standing, and entrepreneurial spirit (Calvet-Mir , Gómez-Bagetthun, Reyes-García 2012).

A good number of studies, Boone and Taylor (2016); Jacobi (2016), have indicated that even though home garden is viewed as subsistence undertaking, it can be developed into cottage industry and commercialisation effort widened with the aim of enhancing food security. Despite the multiple benefits of home gardening, there are also numerous

constraints inhibiting the practice of home gardens and its commercialisation in South Africa. Home gardening is constrained by inadequate access to credits, water, farm inputs, inadequate labour, and inadequate access to markets and extension services. This paper's goals are to describe the socioeconomic traits of houses in White River, South Africa, that have a home garden, to highlight the extent to which those gardens are commercialised, and to identify the variables that influence those decisions.

1.1 Literature Review

Agriculture must change from being practised primarily for subsistence to being a market-oriented system of production that increases smallholders' incomes from agriculturally linked businesses. Growing the units of output or yield, increasing value adding, and producing for both domestic and foreign markets translate to commercialization. Economic expansion and thriving agricultural output, which is connected to food security and nutrition, are the driving forces behind the commercialization of all agricultural crops (Babu *et al.,* 2014; Hebard, 2016). Agholor and Ogujiuba (2020) in their study on land reform and farmers' intention to commercialise in Badplaas, Mpumalanga Province South Africa found that subsistence farmers may willingly transition to commercial farming because of the known benefits associated with commercialization. The study went on to state that intention, which is thought of as a reliable indicator of subsequent behaviour, is influenced by a wide range of diverse elements, and that the more forceful an intention for behaviour is, the more successful an adoption decision will be..

There are numerous challenges that potentially locked smallholder farmers in poverty, most especially those cultivating small acres of land. In most developing countries, commercialization and industrialization are dwindling and farming is not generating enough employment to help in accelerating agricultural commercialisation. Therefore, millions of smallholder farmers who are trapped with small land holdings have little prospects in commercialisation for increased income (Robbins, 2011). In order to achieve food security and consistently make enough money to support their families, smallholder farmers must modernise and commercialise their production methods. Commercialisation decisions are based on comparative advantages and market indicators. Additionally, smallholder farmers' decision is based on subsistence requirements, yield, and output feasibility (Ogutu, Godecke and Qaim 2017). The commercialisation of home garden has impact on the rural economy since

yield obtained from home gardening activities generates income for rural households. However, in South Africa, the intention to commercialize home garden and factors influencing commercialisation of home garden has not been extensively researched. As a result, this study will advance knowledge and help the government formulate policies regarding the commercialisation of home gardens.

2. Methodology

2.1 Sample and Data Description

The study's focus is on local homes with backyard gardens. Purposive sampling was employed to generate random samples from the heterogeneous population in accordance with Sarstedt et al. (2019); Mauti et al (2021). There were 85 responses from each of the eight communities—Rocky Drift, Msholozi, Phumlani, Parkville, Kingsview, Colts Hill, Yaverland, and Plaston—for a total of 680 respondents. The sample size was then increased to 660, which was deemed sufficient for the dependability of the results following data cleaning, which included the elimination of incomplete datasets and a collinearity test. The questionnaires that were used to collect data were structured in consonant with vegetable farmers in the area by dividing questionnaire into two sections. The first part of the questionnaire was on socio-economic demographics which includes: gender, age, level of education, marital status, farm size, household size, farm experience, other sources of income, household labour, extension services, source of water, access to credit, environmental conditions, postharvest losses, access to agricultural inputs, soil fertility and storage facility. The second section addresses pertinent issues about the household commercialisation index (HCI), which involves the year total production output for each season of production and the sale of vegetables. The main vegetables cultivated in the area were spinach (Spinacia oleracea), cabbage (Brassica oleracea), Lettuce (Lactuca sativa), cucumber (Cucumis sativus), carrots (Daucus carota), beetroot (Beta vulgaris), watermelon, (Citrullus lanatus), broccoli (Brassica oleracea) and tomatoes (Solanum lycopersicum).

2.2 Model Specification

In this study, vegetable commercialisation index (VCI), which is stated as a ratio of the marketed value of vegetables to the quantity of vegetables produced. In a related study Carletto*et al.* (2017), considered the share of

the total value of farm output sold (value of output sold divided by value of total farm output) in measuring commercialisation index. Musah*et al.* (2014); Yalew (2016); Abdu *et al.* (2016); Mamo*et al.* (2017); Addisu (2018) also used ratio of farm produce sold to the quantity of yield or output to determine the degree of commercialisation.

Household commercialisation index measures the ratio of the gross value of crops sales by the farmer*ì* in year *j* to the gross value of all vegetables produced by the same farmer *ì* in the year *j* expressed as percentage. The index also gauges how much domestic vegetable output is moving in the direction of the market. For instance, a recorded value of zero shows that a household is extremely moving to subsistence while index closer to 50 or more is indicative of higher degree of commercialisation. This method demonstrates the assumption that household commercialization is a continuum without a rough line separating commercialised households from non-commercialised households.

All things being equal, a farmer may decide to increase his potential and intention to commercialise his vegetable production business whenever the resources are available. In this study, the level of commercialisation is defined as a continuous variable ranging between a mean of zero indicating complete subsistence to a mean of five indicating fully commercialised (Amsalu, 2014). Because not all of the farmers surveyed grow veggies for sale, there were some variables missing when we calculated our HCI. Besides, some sales prices vary with type of market chosen for transaction at the time of data collection ((Ogutu *et al.,* 2017). The index also gauges how much domestic vegetable output is moving in the direction of the market:

$$HCI_{ij} = \frac{\text{Gross value of vegetable sales } hh\grave{i} \text{ year } j}{\text{Gross value of all vegetable production } hh\grave{i} \text{ year} j} \times 100$$

Farmers' decisions at farm level are influenced by several heterogeneous factors including economic considerations. Challenges of choices are eminent in decision making and to address such, the logit function, which is consistent and unbiased, is best suited in investigating the factors influencing discrete choice in decision making as applied by Reyes, Donovan, Bernsten, and Maredia (2012).

In this study, the logistics regression model was used to represent the relationship between a binary dependent variable and an independent variable since it aids in predicting the likelihood that an event will occur or

that a decision will be taken between two options. The dependent variable was the commercialisation index, which is calculated as the ratio of the value of marketable vegetables to the total value of vegetables produced. The logistic regression equation is stated as follows:

$yì = \chi ì + \varepsilon ì$…..(1)

where:

yì= the dependent variable for vegetable farmers' commercialization index (VFCI)

Note: $VFCIìj = \frac{\text{Gross value of vegetable sales hhì year j}}{\text{Gross value of vegetable production hhì year j}} \times 100$

β= the parameter to be estimated ;χì= the vector of explanatory variables ;εì= is a random variable which is distributed with zero mean and constant variance. The adopted model is expressed as follows:

$Yì = \beta o + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 \ldots\ldots\ldots + \beta_{16} X_{16} + \beta$……..(2)

Yì = is the latent dependent variable that is observable; $X_1 – X_{16}$ = independent variables,

$\beta_1 – \beta_{16}$ = Independent variable coefficient ; ε = error term

2.3 Types of Tests Utilised

2.3.1 Collinearity

The multiple independent variables were subjected to a collinearity protection test because they might correlate in the analysis. The variance inflation factor (VIF) is ideal for detecting multicollinearity in regression models as it allows the accommodation of different predictors (Getahun, 2020). Applying VIF to avoid multicollinearity, we therefore, regressed each predictor against other variables and VIF less than 5 was cleaned from the data analysed.

2.4 The Independent Variables Description And Measurement Used In The Study

Table 1: Description of variables and their measurement

Independent variables	Variable description	Measurement
Gender	Gender of household	Male = 1, female = 0
Age	Number of years of existence	Continuous
Level of education	Educational attainment	Literate = 1, other = 0
Marital status	If household have husband or wife	Married = 1, other = 0
Farm size	Size of home garden in acres	Continuous
Household size	Number of people in a household	Continuous
Farm experience	Number of years in home gardening	Continuous
Other sources of income	Involvement of other work beside home gardening	Yes = 1, otherwise = 0
Household labour	Involvement of household members in gardening	Use household member = 1, otherwise = 0
Extension services	Access to extension services	Yes = 1, other = 0
Source of water	Where water is obtained for gardening	Continuous
Access to credit	Available credit	Yes = 1, otherwise = 0
Environmental conditions	Condition of the location	Yes = 1, otherwise = 0
Storage facility	Problem of storage after harvest	Yes = 1, otherwise = 0

Source: Own compilation2021

3. Results and Discussions

A total of 660 participants took part in the study. Regarding the level of commercialisation, the results suggest that compared to other vegetables grown in the region, spinach had a mean commercialisation index of 2.6 (SD=0.81) and cabbage had a mean commercialisation index of 2.56 (SD= 0.94). This result is expected because spinach and cabbage are not only drought tolerant but can be produced throughout the year in the area. Spinach and cabbage are popular in the area and adapted to a range of climatic conditions and soil, ease of production and postharvest storage. Lettuce, cucumber, beetroot, and carrot recorded mean commercialisation index were 2.35 (SD = 1.06), 2.34 (SD = 0.72), 2.07(SD = 1.01) and

Carrot 2.04 (SD = 1.01)respectively (Table 2).

Our focus group discussions with respondents revealed latent evidence showing that lettuce, cucumber, beetroot, and carrot are in high demand for consumption and that intention to commercialise was indecisive, even though the commercialization index is not high. This result implies that household still produce these vegetables for subsistence. The propensity to commercialize these vegetables may be because of other exogenic factors which this study did not explore.

The cultivation of watermelon, broccoli and tomatoes was not common in the area as compared to other vegetables. However, the mean commercialisation index as indicated in table 2 were watermelon (1.72, SD = 0.81), broccoli (1.71, SD = 0.98) and tomatoes (1.65, SD = 0.63). This result suggests that majority of the vegetable farmers in the area are not oriented towards the market. This result points to the need for characterizing the factors that may have trapped majority of households at lower threshold of commercialisation. As a result, the study used the regression model to explore the puzzling factors, as mentioned in (Table 3).

Table 2.Extent of vegetable commercialization in the study area

Variables	Commercialization index (N=660) Threshold: 1-5			
	Mean	Std error of mean	Std. Dev	Rank
Spinach	2.62	.03	.81	1st
Cabbage	2.56	.36	.94	2nd
Lettuce	2.35	.41	1.06	3rd
Cucumber	2.34	.02	.72	4th
Carrot	2.04	.03	.92	5th
Beetroot	2.07	.03	1.01	6th
watermelon	1.72	.03	.81	7th
Broccoli	1.71	.03	.98	8th
Tomatoes	1.65	.02	.63	9th

Source: Authors processed data 2021

3.1 Factors Influencing Decisions to Commercializing Home Garden Vegetable Production in the Study Area.

According to Table 3, the logistic model used to identify the variables affecting home commercialization of vegetables suggests, Goodness-of-fit test: Pearson = 627.429, Deviance = 802.535;Pseudo R-Square: Cox and Snell = .077, Nagelkerke = .104, McFadden = .059; -2log likelihood =

815.012 and chi-square 52.062. The results indicate in many ways that the model used in the study adequately described the explanatory variables. However, the explanatory variables used were gender, age, level of formal education, marital status, farm size, household size, farm experience, household assistance with labour, extension services, source of water, access to credit, environmental conditions, post-harvest losses, limited access to agricultural inputs, soil fertility and challenges of storage.

Findings indicate that gender was significant, = 0.061, and was positively related to the decision to become commercial (Table 3). According to this result, as more men entered the vegetable producing industry, the commercialisation of vegetable farming rises by 0.269 times.. This result is corroborated by the findings of (Kabiti*et al.,* 2016; Rubhara and Mudhara, 2019)) in their studies on determinants of agricultural commercialisation among smallholder farmers in Zimbabwe, in which it was found that farms owned and managed by males were comparatively highly commercialised than the ones owned by females.

Commercialisation is explained in physical and monetary terms by the decision-making and risk-taking abilities of individual farmers. Availability of resources, skills and knowledge, access to production inputs and other prevailing circumstances may influence decisions to commercialise. Agholor and Nkosi 2020 in their study on water conservation in Ermelo, South Africa found that the log odds of adoption of water conservation practice by females was 0.224 times more than the males. This finding is in line with a study by Agholor and Nkosi 2020, which discovered that the likelihood of smallholder farmers in Ermelo, South Africa, adopting conservation agriculture increased as they aged. Furthermore, result also indicates that age was significant, β =0.008 and positively related to decision to adopt commercialisation of home garden. This finding implies that as respondents' ages rise, commercialisation of vegetable farming rises by an odds ratio of 0.014, while all other study-related factors are held constant. The explanation here is that older farmers are more disposed and eager to commercialise their farm operations. As a result, they frequently take a more aggressive approach to commercialisation choices that attempt to maximize profits. This result is consistent with the study of Agholor and Nkosi 2020; which discovered that the likelihood of smallholder farmers in Ermelo, South Africa, adopting conservation agriculture increased as they aged.

The adoption of commercial vegetable growing was found to be negatively influenced by education level, with a significance level of =0.362. This research shows that the more farmer trainings there are, the higher the likelihood that home gardening will be commercialised in the

future. This result is supported by other studies (Kadafur et.al, 2020; Gebremedhin and Jaleta (2010). Education increases human capital and thus increases the level of managerial competence which may translate into good business decision and commercialisation. In another study, Ochieng *et.al*, (2016) resolved that the commercialisation of finger millet was because of the farmer's level of education. The importance of education in decision making and behaviour change cannot be underestimated as an inducement for vegetable commercialisation.

Marital status was strongly correlated with the choice to commercialise home gardening practices, with a significance level of = 0.224. Married couples are more likely to make decisions together and to favour commercialisation Similar study (Yongshan and Yonghe, 2020) found that married farmers have greater needs for health and medical information, social security information in line with commercialization than single farmers. However, the propensity to decide depends on personal traits that eventually affect the decision to adopt.. Household size was found to be significant (β = 0.265) and positively associated with vegetable farm commercialisation.

This result is likely due to the fact that households with more members may be more inclined to hire family members, sons, and daughters to work in the vegetable garden at home. However, increased available labour will translate into higher output which may invariably induce commercialisation. The research of Abdullah (2019), who examined the determinant factors impacting smallholder rice producers and discovered that household size had an impact on commercialization, supports this conclusion.

Extension services were also found to be significant with β=*0*.027 and positively linked to the decision to commercialise vegetable farming. This result suggests that for every unit increase in extension services given to farmers there are 0.040 times increases of intention to commercialise vegetable farming. Extension services assist in educating farmers and exchanging knowledge. The result is consistent with the findings of Muchangi, Ruzungu, Njiiri, Mukiri, 2021, who found that farmers who accessed technical advice adopted the cultivation of improved macadamia varieties in Embu, Kenya.

Similar studies (Yitayew, Abdulai, Yigezu, Deneke and Kassie2021; Okeyo, Ndirangu, Isaboke and Njeru, 2020b; Folefack, Tsafack and Kamajou (2018) found that extension training programmes on improved crop varieties increased farmers productivity in Siaya, Kenya. In their research on the commercialisation of home gardens in Zimbabwe, Rubhara

& Mudhara discovered that the accessibility of extension services by a farmer has a beneficial impact on the amount of commercialization.

Another variable, access to agricultural inputs (β=0.576) was found to be positively associated with commercialisation of vegetable gardening. This implies that for every unit increase in access and support for agricultural inputs, there is 8.497 increase in the level of vegetable commercialisation. Access to agricultural input is an incentive which may translates into increase production output and commercialisation. This finding is corroborated by the study of Nxumalo, Antwi, Rubhara (2020), found that access to credit facilities increased the use of farm mechanization. In a similar study, Mottaleb, Krupnikand Erensteina (2016), found that access to credit facilities played a major role in farmers' decision making. Similar finding (Agholor, 2021) in his study on user acceptance of integrated pest management (IPM) approaches also found that the degree to which the user of information or innovation has access to resources influence the adoption of IPM. To implement change and commercialise the production of vegetables in the area, vegetable producers need resources such as labour, finance, and technical infrastructure.

Postharvest storage was identified as a problem during our focus group discussion with respondents in the area. Storage facilities, as predicted, were discovered to be significant with a p-value of β=0.416 and positively correlated with the choice to market vegetable farming. According to this study, if all other factors remain constant, there is a 3.68-fold chance that vegetable commercialisation will expand if the infrastructure for storage becomes more readily available. Assuming stable system in vegetable farming, commercialisation decisions are positively interrelated with financial capacity and storage infrastructures that are available. Because they are a perishable good, storage infrastructure is a crucial building block for sustaining local vegetable production. The provision of storage infrastructures together with agricultural extension services and entrepreneurial skills would influence vegetable farmers' decision to commercialise. Many studies (Osmani *et al.,* 2015; Qaim and Ogutu, 2018; Pingali *et al.,* 2019; Kabiti*et al*., 2015) acknowledged the role of farm credit and infrastructures in encouraging commercialization.

Table 3. Logistic Regression Showing the Determinants of Decisions to Commercializing Home Garden Vegetable Production in the Study Area

Explanatory variables	*β*	Std. Error	Exp(B)	*p*< (Sig.)
Intercept	.479		.351	.554
Gender	.061*	1.063	.289	.591
Age	.008	1.008	.014	.906
Level of education	-.362**	.696	10.300	.001
Marital status	.224*	1.251	3.671	.055
Farm size	-.033	.968	.132	.717
Household size	.265**	1.303	10.005	.002
Farm experience	-.070	.932	.333	.564
Household labour	.161	1.175	1.686	.194
Extension services	.027*	1.027	.040	.841
Source of water	-.135	.874	2.861	.091
Access to credit	.283	1.327	1.402	.236
Environmental conditions	-.206	.814	1.399	.237
Post-harvest losses	-.127	.880	.258	.612
Access to Agric inputs	-.576**	.562	8.497	.004
Poor soil fertility and soil erosion	.193	1.213	.679	.410
Storage facility	-.416*	1.213	3.687	.055

,, significance levels at 0.05, 0.01*
Source: Authors processed data 2021

4. Conclusion

The extent of vegetable commercialization showed that spinach had a mean score of 2.6 (SD = 0.81) and cabbage with a mean of 2.56 (SD= 0.94) and ranked 1st and 2ndrespectively. Although the commercialization index is not as high as anticipated, latent evidence suggests that the desire to commercialise was uncertain and that lettuce, cucumber, beetroot, and

carrot are in high demand for consumption. Most households continue to grow these vegetables primarily for survival. In contrast to other vegetables, the region did not cultivate many watermelons, broccoli, or tomatoes. The significant variables influencing the commercialization of vegetable production in the area were gender, level of education, marital status, household size, extension services, agricultural inputs, and storage facilities. The propensity to commercialise maybe attributed to other exogenic factors which this study did not explore. Households' vegetable production commercialisation must be considered as a pathway to the overall economic transformation and poverty alleviation. To attain this essential goal of change, farmers must be inclined to move towards market-oriented production with strategic interventions to develop farm infrastructures vegetable farming.

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