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Factors Affecting Gross Margin of Smallholder Farmers to Indigenous Leafy Vegetables (ILVs) in OR Tambo District Municipality of Eastern Cape Province, South Africa

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ABSTRACT The study examined factors that affect gross margin of smallholder farmers of Indigenous Leafy Vegetables (ILVs) in OR Tambo District Municipality (ORTDM) of Eastern Cape Province, South Africa. Purposive and proportional random sampling were employed to select participants, and primary data was therefore collected from 88 ILV producers using a structured questionnaire. Data was analysed using descriptive statistics and multiple linear regression model. Gross margin analysis was also employed to determine gross margin earned and possible profitability from the production and marketing of ILVs. The study concluded that women dominated the production and marketing of ILVs. A positive gross margin was obtained from production of ILVs and this project's profitability of these vegetables. Market related factors and employment status of a farmer determine the gross margin recorded. Seasonal availability of ILVs seeds and lack of storage facilities are major constraints linked to ILV production and marketing.

INTRODUCTION

There are several Indigenous Leafy Vegetables (ILVs) that are grown globally and within the African continent, which may be convenient to improve the living standards of communities particularly in rural contexts. These vegetables are highly recommended by preceding reviews not only for their potential to improve diets and address food insecurity, but there is also a recognisable economic value that these vegetables may offer to communities at large. However, in South Africa, the production of ILVs is only acknowledged for subsistence purposes with petite informal market record of these vegetables. Thus far, production of ILVs on a larger scale and positioning these vegetables and their products in larger markets may not only benefit farmers in terms of revenues, but it may also create employment opportunities, thus translating to abridged poverty especially in rural communities.

According to Bhattacharjee et al. (2009) and Kuhnllein (2015), Indigenous Leafy Vegetables (ILVs) are known to commonly grow impulsively in the natural ecosystem and have been serving humankind for food and medicine purposes in almost all societies for generations. For this study, ILVs are defined as vegetables that have their origin in a country and are produced and found growing within the country under various weather conditions with a number of these vegetables harvested from the wild (Oelofse and Van Averbeke 2012). Ekesa et al. (2009) further emphasise that ILVs are habitually easier to grow, resistant to pests and diseases when comparing to exotic vegetables such as cabbage and spinach, and ILVs are also quite acceptable to local tastes. Moyo et al. (2013) recognise the same sentiment in that ILVs hold high horticultural potential based on their long utilisation history by local communities across Africa.

The nutrition value of ILVs, their collection, consumption, harvesting, preservation, marketing and perceptions of people towards these vegetables including their role in addressing food insecurity, have received an increasing amount of attention from several studies globally (Shonshai 2016). However, there is lower production of ILVs in some African countries like South Africa regardless of their noted value to represent an affordable but quality nutrition to the poor both in urban and rural areas where malnutrition is ubiquitous (Mbhenyane 2017; Maseko et al. 2017). Thus far, Nyembe (2015) observes that ILVs have the potential to make a significant contribution to food and nutrition security, to protect against internal and external market dis-

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ruptions and climate uncertainties, and creating employment opportunities, thus enhancing sustainability for both urban and rural dwellers (Wemali 2015; Maseko et al. 2017). For instance, a study conducted by Oladele (2011) on the contribution of indigenous vegetables and fruits to poverty alleviation in Oyo State, Nigeria discovered that the amount of farmers' income generated from ILVs is significant and consequently the interpretation is that these vegetables help in alleviating poverty. This means that if ILVs were to be produced on a larger scale and be commercialised, their commercialisation in the domestic markets would result in raising the standard of living to those involved in trading activities of ILVs, in both rural and urban contexts.

There is limited literature concerning the marketing of ILVs in South Africa, and the little related literature focuses on commercialisation of ILVs as well as the value chain system of ILVs, which also lacks some of the information. To this end, Mpala et al. (2013) contend that there is no support from the government and other organisations, which train farmers on how to grow ILVs. This has contributed to limited marketing of ILVs with most farmers producing these vegetables for their own consumption with little harvest reaching either the informal or formal market (Senyolo et al. 2018). DAFF (2013) and Maseko et al. (2017) further argue that regardless of the nutritional and economic value, which ILVs may offer, these vegetables and their foodstuffs are not commercialised, and the excess of the produce is only traded informally within communities to generate income for the farmers. Thus far, the study may generate information, which explains limited inclusion of ILVs in the farming system as well as minor informal market record of these vegetables. Therefore, the aim of the study was to analyse the factors affecting the gross margin of smallholder farmers to ILVs from the OR Tambo District Municipality of the Eastern Cape Province, South Africa.

Objectives

1. To profile demographic characteristics of smallholder ILVs farmers in the study area.
2. To determine factors influencing the gross margin of ILVs smallholder farmers in the study area.
3. To identify constraints in production and marketing of ILVs by smallholder farmers in the study area

MATERIAL AND METHODS

Study Area

The study was conducted in OR Tambo District Municipality (ORTDM) and the district is located to the east of the Eastern Cape Province, on the coastline. It is bordered by the Alfred Nzo District Municipality to the north, the Joe Gqabi District Municipality to the northwest, the Amathole District Municipality to the southwest and the Chris Hani District Municipality to the west. The municipality is formed by five local municipalities, which include King Sabata Dalindyebo, Nyandeni, Mhlontlo, Port St Johns and Ingquza Hill. It covers about eighty percent of what used to be marginalised homeland in the Transkei and is one of the four Integrated Sustainable Rural Development Programme (ISRDP) nodes in the province. The district is diverse in natural vegetation, which includes palatable plants for food, medicinal purposes and other household uses (Eastern Cape Development Corporation (ECDC) 2018). Hence the district was chosen for the purposes of the study.

Data Collection

The population of ORTDM comprised of 314,081 households, and 138 rural households (comprising of producers and non-producers of ILVs) were selected for the purpose of the study using a proportional random sampling method. From the 138 households, a purposive sampling was therefore employed to select farmers, which are producing ILVs within the district. This means that proportional random and purposive sampling procedures were used to select producers of ILVs within the district based on the assumption that producers are not only producing ILVs, but they also market these vegetables. A total of 88 ILV producers were therefore drawn using a purposive sampling technique from rural households of all the five local municipalities from ORTDM being considered. These local municipalities included King Sabatha Dalindyebo, Nyandeni, Ingquza hill, Mhlontlo and Port

St. Johns municipalities. Therefore, primary data was collected from producers of ILVs using a structured questionnaire through face-to-face interviews and observations. The information gathered included socio-economic characteristics of households, grown ILVs and their production costs, yields, cost and revenues of marketing of ILVs, and problems connected to production and marketing of ILVs.

Data Analysis

Data was analysed using both descriptive and inferential statistics. Descriptive statistics such as mean, standard deviations, frequencies and percentages were employed to profile socio-economic characteristics of farmers, ILVs grown and problems associated with production and marketing of ILVs. A Gross Margin (GM) analysis was used to estimate gross margin experienced from the ILVs, which were produced and sold within the district. For this paper, a GM analysis models the costs and revenues of ILVs per kilogram (kg) per hectare (ha) and per production cycle or season. For instance, a physical amount of each ILV is multiplied by the unit price of ILV sold so as to determine revenues. Also, a profitability ratio such as cost-benefit ratio was also calculated to determine the profitability of ILVs production.

The Total Revenue (TR), which is equivalent to ILVs gross income from each ILV, was calculated as:

$TR_i = P_i \times Q_i$

Where, P_i is the farmgate price of ILVs, and Q_i is the total quantity produced for each ILV

Total Variable Cost (TVC) was calculated using the following expression:

$$TVC = \sum_{i=1}^{2} (K+S+L)$$

Where, K is fertiliser expenditure S is total expenditure on seeds/seedlings, and L is total labour expenditure in ILVs.

The gross margin (GM) analysis of ILVs marketing was expressed as:

GM= TR-TVC

Where, GM is Gross Margin, TR is Total Revenue, and TVC is Total Variable Cost.

This model was adopted following Nyaruwata (2019), who recently employed GM analysis to determine profitability of ILVs in Zimbabwe.

The Cost-Benefit Ratio can be calculated using the formula expressed below:

Cost-Benefit Ratio = Total Revenue/Total Costs

A multiple linear regression model was used to analyse factors influencing the ILVs gross margin from produced ILVs within the ORTDM. The implicit goal of using the model was to estimate a relationship between socio-economic characteristics of producers and other factors related to marketing of ILVs over gross margin obtained from sales of ILVs. A multiple linear regression analysis is an extension of a simple linear regression analysis and is used to assess the association between two or more independent variables and a single continuous dependent variable. For this paper, a GM attained from each producer was treated as a continuous dependent variable and regressed against several independent variables as indicated in Table 1.

According to Bremer (2012), a multiple regression model can be expressed as follows:

$$Y= \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + \beta_9X_9 + \beta_{10}X_{10} + \beta_{11}X_{11} + \mu_i$$

Where:

Y = Gross Margin earned
β_0 = Intercept term
β_i to β_{11} = Regression coefficients
X_1 = Age of a farmer
X_2 = Gender of a farmer
X_3 = Household size
X_4 = Farm income per month
X_5 = Level of education
X_6 = Employment status of a farmer
X_7 = Size of Arable land
X_8 = Access to extension services related to ILVs
X_9 = Costs of production
X_{10} = Price of ILVs sold per kg
X_{11} = Quantity sold per kg
μ_i = error/disturbance term

RESULTS

This section presents descriptive statistics results of respondents by issuing socio-economic characteristics of respondents from the study area, grown ILVs from the area and projects enterprise budget of ILVs per hectare per production season. The section further presents results on the determinants of the gross margin of ILVs

Table 1: Hypothesized independent variables influencing ILVs gross margin

Dependent variable	*Description of variable*	*Anticipated sign*
Gross Margin (South African Rands) (Y)	Continuous	
Independent variables	Description of variables	Anticipated sign
Age (X_1)	Actual age of a respondent (years)	+
Gender (X_2)	Dummy: male = 0; female =1	+/-
Household size (X_3)	Actual size of household members (numbers)	+/-
Farm income (X_4)	Actual income earned (ZAR)	+
Level of education (X_5)	Categorical: 0 = Never went to school; 1= primary education; 2= secondary education; 3= tertiary education	+/-
Employment status (X_6)	Dummy: employed = 0; otherwise =1	+/-
Size of arable land (X_7)	Actual size of land (hectares)	+/-
Access to extension services related to ILVs (X_8)	Dummy: have access = 0; otherwise =1	+/-
Costs of production (X_9)	Continuous variable	+/-
Price of ILVs sold per kg (X_{10})	Continuous variable	+/-
Quantity sold per kg (X_{11})	Continuous variable	+/-

Source: Authors' work 2020

producers and constraints linked to production and marketing of ILVs from ORTDM.

Demographic Characteristics of Farmers

From this section, statistics on demographics and socio-economic characteristics of ILV producers are presented in Tables 2 and 3.

According to the descriptive results, respondents were ranging between a minimum age of 26 years to a maximum age of 77 years, with an average age of 51 years, which explains that participants are still in their active age and can withstand the rigorous work associated with the pro-

Table 2: Age and household size distribution of respondents from ORTDM

Variable	*Age*	*Household size*
N	88	88
Mean	51.51	7.43
Std deviation	14.080	2.638
Maximum	77	13
Minimum	26	3

Source: Research Survey 2020

Table 3: Distribution of socio-economic characteristics of respondents

Index	*Outcome*	*Frequency*	*Percentage (%)*
Gender	Female	56	63
	Male	32	37
Level of Education	Never went to school	22	25
	Primary education	43	48
	Secondary education	15	17
	Tertiary education	8	9
Farm Income (South African Rands)	No farm income	39	44
	R1000-R3000	12	14
	Income from exotic vegetable sales	14	16
	Income from livestock sales	5	6
	+R3000	18	20
Employment Status	Employed	23	26
	Unemployed	65	74
Size of Land (Hectares)	0ha to 0.5ha	65	72.8
	0.6ha to 2ha	23	26.2

Source: Research survey (2020)

duction and selling of ILVs. Regarding household size, descriptive results revealed that household members were ranging between 3 to 13 members with an average of 7 members. This means that on average, respondents have a fair number of members, which could be useful in both production and selling activities of ILVs, thus benefiting a household in terms of income generation.

Regarding gender, descriptive results revealed that a majority (63%) of ILVs producers within the area are females when compared to men's participation in the production of ILVs. Descriptive results further revealed that most producers (48%) of ILVs from the study area are educated up to primary education while twenty-five percent of the ILVs producers never went to school. Also, seventeen percent of ILV producers are educated up to secondary level, while only nine percent of ILV producers are educated up to tertiary level. Concerning farm income, a majority (44%) of ILVs producers were not earning any farm income, thus making such producers producing ILVs only for subsistence use. Furthermore, descriptive statistics confirmed that fourteen percent of producers are earning income ranging between R1000 and R3000 per production season, while twenty percent of ILVs producers are generating income, which is greater than R3000 per production season. Producers of ILVs also claimed to be practising other farming activities, for instance, ILVs producers from the study area have sixteen percent of the income earned from exotic vegetable sales while six percent of the income is also generated from livestock sales. Concerning employment status of ILVs producers, a majority (74%) of the producers are unemployed, while only a few (26%) of ILV producers are employed as established by descriptive results. Lastly, descriptive results revealed that, about 72.8 percent of the producers use land between 0ha to 0.5ha to produce ILVs, while only 26.2 percent are producing between 0.6ha and 2ha of land.

Grown ILVs from ORTDM

Figure 1 shows the statistics or production level of ILVs in percentages (%), which are produced and considered for sales within the study area.

The study results revealed that Amaranth vegetable is the most (95%) produced ILV from the study area, which is followed by Nightshade

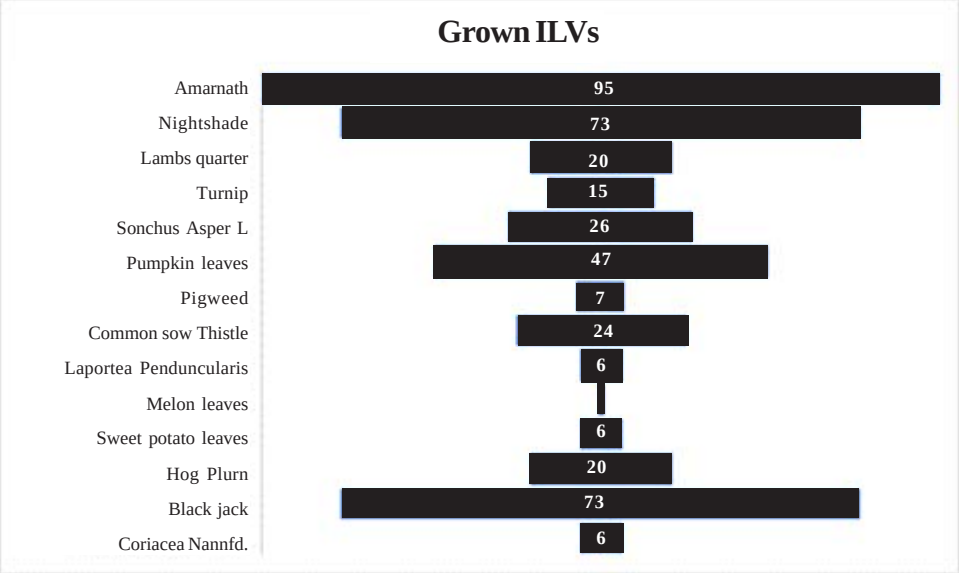

Fig. 1. Grown ILVs from ORTDM
Source: Research Survey 2020

and Blackjack both at sevety-three percent as indicated in Figure 1.

Projected Enterprise Budget

Table 4 shows that the gross revenue, total cost and gross margin per hectare were R29,500, R6750 and R22,750, respectively. This therefore shows a positive gross margin from production and marketing of ILVs from ORTDM, which may further indicate that farmers are at least generating enough income for their households.

Table 4: Projected enterprise budget for ILVs production per hectare per production season

Item	*Value (R) per hectare*
Revenue 2950kg @ R10.00 per kg	R29 500.00
Less Variable Costs	
Seeds/seedlings	R 1725.00
Ploughing	R 450.00
Fertilizer	R 1550.00
Harvesting and Hauling	R 500.00
Labour	R 625.00
Packaging	R 200.00
Storage	R 800.00
Marketing space	R 550.00
Transport	R 350.00
Total Variable Costs	R 6750.00
Gross Return	R 22 750.00

Source: Author's compilation, 2020, based on the study survey

The cost-benefit ratio was also calculated as a way of assessing a possible enterprise profitability. Ratios in a firm are calculated or useful when assessing farm profitability and performance record, and hence, a cost-benefit ratio was calculated below. As shown in Table 4, the production of ILVs from the study area does not entail fixed costs, as it was difficult to get data on fixed costs such as fencing expenses or depreciation of some fixed assets, which include plough, planters, hoes, spades, etc. That is why the fixed costs were not included when estimating the cost benefit ratio of ILV marketing. Therefore, the cost benefit ratio for ILV production was calculated based on total variable only as (total costs) and is expressed in the calculation below.

Cost Benefit Ratio = Total Revenue/Total Cost
= R29500.00/R6750.00
= 4.37

This is equivalent to R4.37.

Determinants of Gross Margin Earned by Farmers

The theoretical model of the study included 11 explanatory variables, however, from the 11 explanatory variables, which were included in the model, only three variables were found to be significant towards influencing the gross margin of ILV producers from the study area. The direction of influence for the significant variables is given in detail as follows.

For the explanatory variables with a positive coefficient, it simply means that as any of these variables increase so does the gross margin of a farmer, while a negative coefficient implies that, an increase of an explanatory variable is likely to decrease the gross margin. Thus far, regression estimates confirmed that the price of ILVs sold per kilogram and quantity sold per kilogram positively influence gross margin of farmers from ORTDM. In addition, employment status of farmers negatively influences gross margin and each significant explanatory variable is explained in the discussion section.

Constraints Linked to Production and Marketing of ILVs

Concerning the production of ILVs, scarcity of irrigation water, lack of access to information about producing ILVs, lack of access to information linked to use of ILVs and seasonal availability of ILVs seedlings are the enlisted constraints, which are faced by ILVs producers from ORTDM. Regarding marketing of ILVs within ORTDM, storage facilities and lack of knowledge about preservation methods are recorded as constraints, which inhibit marketing of ILVs. Detailed discussions pertaining production and marketing of ILVs are presented in the discussion section.

DISCUSSION

This section discusses the research findings based on the results discovered by the paper. This means that descriptive results and pragmatic results are presented in detail from this section relating the discussion to the recent studies conducted in the subject of the paper.

Descriptive Results Discussion

Socio-economic Characteristics of Farmers

This section presents a detailed discussion towards socio-economic characteristics of farmers from OR Tambo District Municipality based on the established results.

Farmer's Gender

Descriptive results established that there are more women involved in the production of ILVs as compared to men. Several authors also came to a similar conclusion, arguing that women are recognisable players in both the production and marketing of ILVs. This arises from the fact that these vegetables require minimal capital to produce and to start a business when comparing to start a business of exotic vegetable production (Shonshai 2016). To this end, based on the results and previous research, both production and marketing of ILVs is mainly practised by women.

Education Level of a Farmer

Descriptive results revealed that a majority of ILVs producers from the study area are educated up to primary level. Shackleton et al. (2010) and Mayekiso (2016) also convey that most farmers who are producing ILVs have limited formal education. Thus far, obtaining formal education by smallholder farmers may likely improve their farming skills towards ILVs, and this may ultimately increase the production of these vegetables. Enhanced production of ILVs could therefore attract larger markets for these vegetables and their products, which may lead to higher gross margin experienced.

Farm Income Obtained by a Farmer

Concerning farm income obtained by farmers, descriptive results indicated that most of the ILVs producers are not earning any farm income, and thus, perhaps leading such farmers to produce ILVs only for subsistence use. Similar findings were also established by DAFF (2013) and Maseko et al. (2017) who assigned that in South Africa farmers who produce ILVs commonly produce these vegetables for subsistence consumption. Descriptive results also revealed that there are producers who are earning income from ILVs sales, and this income starts from R1000 to an amount greater than R3000 per production season. Regardless of the income generated from ILVs by farmers, Gido et al. (2016) argue that ILVs are found to have substantial economic potential and this is evident by the commercialisation of ILVs in some of the African countries, which include Uganda, Ghana, Kenya and Nigeria. Thus, the commercialisation of ILVs is progressively increasing with several advantages of improving household income and creating job opportunities along the vegetable value chain particularly for rural farmers.

Employment Status of a Farmer

Descriptive results further established that most of the ILV producers from the study area are characterised by unemployment. Similar comparable findings were shared by Jansen van Rensburg et al. (2007) and Mayekiso et al. (2017) arguing that in most areas, particularly within rural contexts, people who participate in ILV production and selling of these vegetables are associated with poverty and labelled as poor and backward people. Given the study results and previous reviews, people who are more involved in production and marketing of ILVs are those characterised by redundancy.

Size of Land

Most ILV farmers produce these vegetables on a land between 0ha to 0.5ha as established by descriptive results. This is because most producers claimed that the remaining land is commonly reserved to cultivate field crops such as maize and vegetables in some seasons. Given these results, Mayekiso (2016) argues that generally, ILVs normally compete with exotic vegetables, which include maize and commercial crops for land. Thus, leading to most of the land utilised for the production of such vegetables particularly within rural settings. Thus far, based on the study discoveries and prior research, farmers would rather opt to reserve most of their land for cultivating field crops and other vegetables at an expense of ILVs.

ILVs Grown In the Study Area

The descriptive results indicated that Amaranth and Nightshade are the popularly produced ILVs from the study area. This means that these vegetables are the recognisable ILVs within the district, which are commonly grown when compared to other ILVs produced from the area. The results may further explain a higher demand of these vegetables and possible favourable conditions to grow these vegetables within the district. Similarly, Nyathi et al. (2016) report that ILVs tend to have several advantages when compared to exotic vegetables and these advantages included, ILVs being drought tolerant, requiring minimum inputs, being resistant to pests and diseases, requiring less water and contributing significantly to nutrition and household income particularly in rural areas. Also, Ngugi et al. (2017) further emphasises that, although there is an acknowledged demand for ILVs, the supply for these vegetables is not met due to constraints, which are experienced by farmers. These constraints included lack of access to high-value markets, water scarcity and limited knowledge of their supply chain. Descriptive results also confirmed that Pigweed, *Laportea Penduncularis*, sweet potato leaves, *Coriacea Nannfd* and melon leaves are the least produced ILVs from the study area.

Projected Enterprise Budget

From the projected enterprise budget, a cost benefit ratio was calculated as shown in Table 4. A cost benefit ratio of 4.37 was obtained, and this means that, for every R1.00 that a farmer invested in the production of ILVs within the study area, the return was R4.37. This explains that ILV production was very profitable. Ebert (2014) also demonstrates higher profitability on certain ILVs within the African continent, and these included Amaranth, Mungbean and Drumstick tree, which are currently proven for their potential in wider adoption and commercial exploitation. Senyolo et al. (2018) contend that, ILV smallholder farmers are currently experiencing higher gross margins when compared to other contributors in the ILV production value chain.

Determinants of Gross Margin from ILV Producers at ORTDM

This section presents and discusses factors, which influence the gross margin obtained from the production and marketing of ILVs. The explanatory variables, which were quantified, included socio-economic characteristics of farmers and factors related to marketing of ILVs.

Price of ILVs Sold Per Kilogram

A positive significant relationship (at 1% level) was confirmed between the price of ILVs sold per kilogram and gross margin. These results imply that as the selling price of ILVs per kilogram increases, the gross margin obtained by farmers is likely to increase. These results further suggest that the higher the selling price of ILVs, the higher the gross margin may be experienced. These results are like those of Ebert (2014) arguing that several ILVs within the African continent are substantial of their commercial value, which makes a significant contribution to household income. For instance, Hughes and Ebert (2013) also cite several examples of profitable production of ILVs in East and West Africa, and these vegetables included Worowo (*Solanacio biafrae*), Cockscomb (*Celosia argentea*), African eggplant (*Solanum macrocarpon*) and Amaranth. Thus far, Otieno et al. (2016) argue that a higher production and higher demand of ILVs may contribute to farmers' household income through sales of these vegetables.

Quantity of ILVs Sold Per Kilogram

Table 5 indicates that there is a positive significant association at a level of one percent between the amount of ILVs sold per kilogram and gross margin earned. These results suggest that the higher the amount of ILVs sold per kilogram, the higher the likelihood of increased gross margin. The study therefore reveals that a unit increase in ILV sold may increase the gross margin earned by farmers. Similar comparable findings were also discovered by Gido et al. (2016) establishing that increased production of ILVs, processing and preservation technologies for these vegetables guarantees food security,

employment opportunities and improved household income. Maseko et al. (2017) also state that an enhanced production of ILVs by farmers may have a potential to significantly contribute to household income.

Table 5: Factors influencing gross margin of ILV producers from ORTDM

Variables	*Beta coefficients*	*t-statistics*	*Significance*
Constant	1.684	2.979	0.003
Price of ILV per kg	0.459	5.016	.000*
Quantity sold per kg	0.291	3.171	.002*
Employment status	-0.127	-2.079	.040**
Model summary			
F-value = 11.01			
R squared = .590			
Adjusted R squared = .572			
Number of Observations = 88			

Note: * and ** indicate significance level at 1% and 5% respectively
Source: Research survey 2020

Employment Status of a Farmer

The employment status has a negative significant relationship with gross margin at five percent level as confirmed by regression estimates. Thus, as a farmer gets employed, there is a chance of a decreased gross margin earned. These results reveal that the employment status of a farmer has a negative influence towards gross margin experienced. This could be a reason that if a farmer is employed, there may be chances that such a farmer is focusing more on the job rather than activities associated with the marketing of ILVs. This may therefore ultimately lead to lack of attention concerning marketing of ILVs, which may consequently lower gross margin. Furthermore, Ndengwa (2016) mentions that socio-economic characteristics such as the level of income and employment status of a household head negatively influence participation in activities linked to the production of ILVs, hence lower gross margin may likely be experienced.

From the non-significant hypothesised variables, farm income obtained per month and size of arable land were expected to be significant, however the coefficients of these two variables were not significant. The case may be that the information provided by farmers of ILVs was not convincible enough for these variables to be significant, thus making a little variation when comparing them to other significant explanatory variables from the model. The prediction of significance was made since both variables may either cause an increase or a decrease towards gross margins experienced by farmers.

Constraints to Producing and Marketing ILVs

This section presents the production and marketing constraints encountered by producers of ILVs as discovered by descriptive results. A detailed discussion of these constraints is presented below.

The major constraints, which militate against the production of ILVs in ORTDM are seasonal availability of ILVs seeds/seedlings, scarcity of irrigation water and lack of access to information about the use of ILVs with seasonal availability of ILVs seeds/seedlings ranking the highest restriction linked to production of ILVs. Similarly, Senyolo et al. (2018) also discover that lack of technical assistance on production and lack of good quality seeds for ILVs are the major constrains linked to the production of ILVs. Regarding marketing of ILVs, lack of storage facilities is a limiting problem to sales of ILVs as shown in Table 6. This is obvious since ILV sellers are commonly selling these vegetables in

Table 6: Constraints associated with production and marketing of ILVs

Constraints to ILV production	*Percentage (%)*	*Constraints of ILV marketing*	*Percentage (%)*
Scarcity of irrigation water	66	Lack of knowledge about preservation methods	47
Lack to access to information about producing ILVs	55	Lack of storage facilities	61
Lack of access to information about ILVs use	62	-	
Seasonal availability of ILVs seeds/seedlings	71	-	-

Source: Research survey 2020

smaller quantities on daily basis. This indicates that if there could be proper storage facilities there may be a possible increase in ILV sales thus translating to higher gross margins. Senyolo et al. (2018) further suggest that providing cold storage facilities closer to the ILVs smallholder farmers in rural areas may reassure continuance of production, which may eventually improve revenues.

CONCLUSION

This paper revealed that women dominate the production of ILVs within the ORTDM with most producers educated up to primary level. The paper further revealed that most producers of ILVs from ORTDM are not employed and do not generate any farm income from ILVs. Thus, farmers are producing ILVs only for subsistence use rather than marketing these vegetables. The study further showed that Amaranth, Nightshade and Blackjack are the most frequently grown ILVs by farmers with positive gross margin, consequently also showing profitability of these vegetables. The gross margin of farmers from ORTDM is affected by the price of ILVs sold per kg, amount of ILVs sold per kg and employment status of a farmer. To this end, the paper concludes that lack of irrigation water, seasonal availability of ILVs seeds/seedlings and lack of access to information about the use of ILVs are the major problems linked to production of ILVs. On one hand, lack of storage facilities is a major constraint, which is associated with marketing of ILVs from ORTDM. Based on the paper findings so far, it can be concluded that producing ILVs can bring greater revenues and given the revenues and positive gross margin obtained, this farming activity has a potential of improving livelihoods particularly for the rural dwellers.

RECOMMENDATIONS

Production and marketing of ILVs is common among women from the study area. Promoting awareness by providing information related to nutrition, health and economic benefits about ILVs by policies is still needed, so that all genders, people from different socio-economic characterisation could be involved not only in the production of ILVs but also in marketing of these vegetables for greater efficiency. Also, information regarding the use of ILVs, particularly the nutrition and medical value information should be made available through government institutions such as schools, clinics, department of agriculture to mention a few and this can be done in a form of knowledge transfer, booklets and presentations. This may therefore trigger a high demand of these vegetables by consumers. The media may also be involved in this regard through radio and television so to bring an idea of the economic value, which the ILVs may contribute to communities at large. Furthermore, the amount and price of ILVs sold per kilogram positively attracts a higher gross margin, thus government intervention through investments in ILVs production is needed and this may speed up the conversion of producers from subsistence to commercial in both production and marketing, respectively.

Seasonal availability of ILVs seeds/seedlings is a major constraint linked to the production of ILVs, and this therefore calls for policymakers and relevant government institutions to introduce ways of propagating the seeds of ILVs so that they may be made available throughout the year. This may therefore increase demand for these vegetables and enhance yields. The local government should allocate market shops for ILVs sellers where the place could serve not only as an outlet for ILVs and their products, but it may also serve as a storeroom/storage where excess supply could be kept since lack of storage militate marketing of ILVs. Lastly, more research on the subject matter of the paper is advised so as to expand information concerning production and marketing of ILVs for commercial purposes in future.

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