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Explaining Farmers' Income via Market Orientation and Participation: Evidence from KwaZulu-Natal (South Africa)

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Abstract: In many sub-Saharan African nations, commercializing smallholder agriculture has recently been seen as a strategy for attaining equitable growth and eliminating poverty in a sustainable manner. Despite the distinction made between market participation and market orientation, their respective impacts on farm income have not been given enough attention in the literature. In this paper, their respective determinants are analysed and each of them is linked to smallholder farmers' income. The survey was conducted in and around four irrigation schemes in KwaZulu-Natal. Using a sample of 332 farmers, the study estimated the output participation index/market orientation index and employed the two-limit Tobit and OLS regression models. The findings show that socioeconomic, institutional and production factors influence market orientation and participation differently. In addition, market participation is more important in explaining farmers' income compared to market orientation. Moreover, farmers had a higher rate of market participation index (83%) while their market orientation index was very low (38%). Market orientation is, therefore, not a pre-condition for market participation. In smallholder agriculture, market participation is a function, mainly, of marketed surplus. These realities are valid for smallholder agriculture and in sharp contrast with commercial agriculture. Engaging smallholder farmers more in market participation rather than market orientation would be a better strategy to improve their access to markets and eventually enhance their income. Market orientation will then become the unintended outcome of continuous engagement of farmers with the market.

Keywords: cabbage production; market participation; market orientation; farmers' income; South Africa

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1. Introduction

In developing nations, agriculture remains an essential sector for ensuring livelihoods, employment, food security, the reduction of poverty, and environmental sustainability [1]. However, many rural African households still produce for subsistence, and the majority are not connected to local, national, regional, or global markets [2]. In many sub-Saharan African nations, commercializing smallholder agriculture has been seen as a strategy for achieving agricultural growth and eliminating poverty in a sustainable manner. Commercialization of agriculture refers to the process of moving from subsistence to market-based farming [3]. Market participation becomes an issue after harvest, when there is marketable surplus, but market orientation is mind-set that influences farm decisions before, during and after production. As a result, market participation and market orientation may not be determined by the same set of factors [4].

Studies show that smallholder farmers in developing countries participate in the product market only seldomly [5–7]. The reasons could be the high costs of intermarket commerce, and poorer households' access to improved technologies and productive assets [5]. This has slowed down agriculturally driven economic growth and postponed agriculture's potential to assist most rural populations in reducing poverty. Smallholder

farmers are consequently unable to take advantage of the welfare benefits and income improvement linked to market participation. Smallholder farmers have to produce marketable surplus and commercialize their products for agriculture to meaningfully contribute to economic growth [8].

On the other hand, the term "market orientation in agriculture" refers to a choice made by a farmer regarding their production that is impacted by both market signals and their specific production circumstances [4,9]. Market orientation in agriculture is also described as the proportion of resources (land, labour, and capital) committed to the production of agricultural goods intended for sale or trade [10]. So, if smallholder farmers produce marketable goods and pay attention to market signals, they are termed as market-oriented [4]. In this context, it is important to understand the link between market orientation and farm income as it informs policy makers and other stakeholders/partners in changing small scale farmers' mindsets so that they can benefit from farming. Given the changing sizes and locations of farms in many emerging nations, particularly in sub-Saharan Africa (SSA), this may be especially crucial [11].

Small-scale farmers in South Africa, like those in other developing nations, struggle with issues such as limited access to information, access to credit and factors of production, vague property rights, high transaction costs, and restricted markets [12–14]. Most of these farmers practice subsistence farming, which relies mostly on family labour, and one or two cash crops in order to support their families [15]. For instance, cabbage is mostly grown by smallholder farmers in KwaZulu-Natal (KZN), and it is a substantial source of income for them [16]. This is because there is a high local demand for this crop owing to its high nutritional value and the ease with which the vegetable can be affordably accessed and prepared [17]. Cabbage is an easy pick when it comes to crops that are less challenging to grow. It has a high yield, is relatively less perishable with a substantial shelf life at room temperature, and requires much fewer chemical inputs [18].

However, due to various institutional and socioeconomic constraints, smallholder farmers in South Africa have low participation rates in formal commercial and high-value marketplaces [19,20]. To access mainstream markets (e.g., supermarkets and fresh produce markets), smallholders face structural challenges such as heterogeneity of the product, failure to meet stringent market requirements, failure to supply consistently, the smallness of the quantity of produce they supply, transaction costs of dealing with many of them coupled with the small value of the transaction and failure to comply with contracts on the part of smallholders. The majority of smallholders sell to informal markets (i.e., street vendors, local tuckshops, bakkie traders, etc.). Farmers sell their products to these 'second best' options not because they find them profitable but rather because they are unable to reach better markets. Such market outlets often offer low prices. They are pursued out of desperate attempts to dispose-off products that would otherwise perish quickly [19,21–23].

Various studies have examined the role of farm size in smallholder farm profits, food security, and the productivity gap between commercial and smallholder farmers [24–27]. Other studies have also looked at the barriers faced by small-scale farmers in accessing markets and enhancing the value of their produce [28–30]. There are, however, no studies that link market orientation and market participation in explaining farmers' income. Because of this, this study investigates the distinction between the two, studies their respective determinants, and examines how each affects farmers' income. The purpose of understanding this distinction is to inform production and marketing-level interventions. This corresponds to the South Africa's Marketing of Agricultural Products Act of 1996, which focuses on increasing markets for farmers, the efficiency of the marketing systems, and enhancement of the viability of the agricultural sector among others. The creation of government policies and programs promoting mono-cropped systems with contemporary varieties as well as on-farm crop diversity and intercropping, which have decreased significantly over the past ten years, would be aided by closing such information gaps. Additionally, it is important to analyse the factors that influence market orientation and market participation independently when developing production and marketing strategies for smallholder farmers' commercial transformation.

This study is unique in several ways. First, the determinants of market orientation and participation have been analysed separately with the inclusion of production, socioeconomic, institutional, and market-related factors. Most studies in the past have focused only on socioeconomic and institutional factors. Secondly, none of the previous studies have examined the contribution of market orientation and participation to farmers' income, which this study has. Finally, this study has utilized the two-limit Tobit model to estimate the determinants of both market orientation and participation because both indices are bounded between 0 and 1. Most of the previous studies used a generalized ordered probit model for similar analyses, which predict values below 0 and/or above 1. The rest of the paper is organized in the following order: conceptual framework, empirical methodology, results and discussion, conclusion, and policy recommendations.

2. Conceptual Framework

Figure 1 illustrates the study's broad conceptual framework, which is based on a number of empirical studies on farmers' market orientation and product market participation, including those by [31–33]. Many production variables affect crop productivity which, in turn, affects marketable surplus. Production/productivity variables are crucial because if there is no marketable surplus, it is of no use to talk of either market orientation or market participation. Additionally, socioeconomic, institutional, and marketing factors will have an impact on farmers' gross income by influencing market orientation and product market participation. The focus of this study is on how these variables affect crop market participation (COMP) and marketing orientation (MOI) and how each relates to farmers' earnings from selling their produce. Farmers will also be better able to access inputs and other agricultural services, such as extension, loans, and training, when their income rises, the feedback loop.

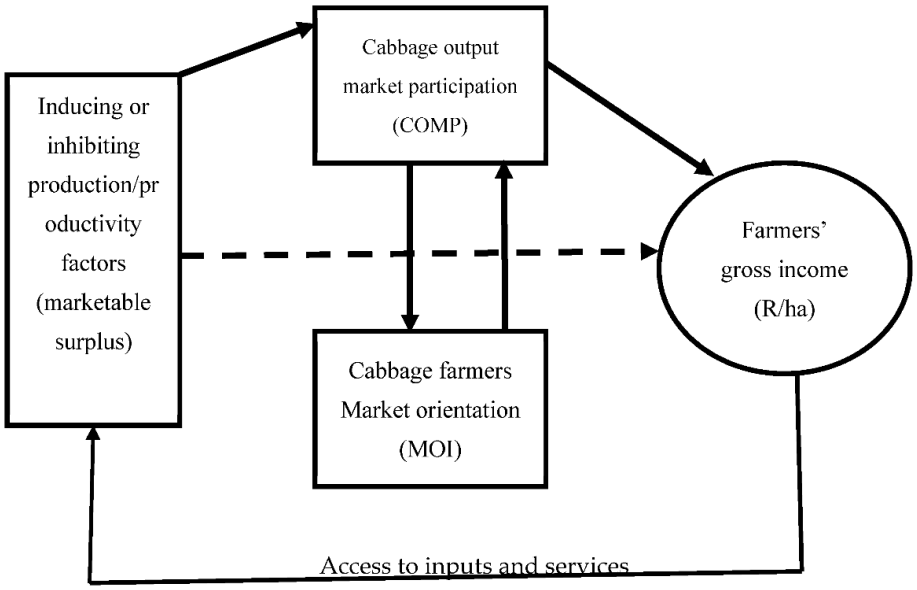

Figure 1. Conceptual framework.

3. Empirical Methodology

3.1. Study Area and Sampling

The research focused on four irrigation projects in KwaZulu-Natal (Makhathini, Ndumo B, Tugela Ferry, and Bululwane). The sample includes 332 smallholder farmers that grow cabbage. The sample was drawn utilizing stratified random selection (see Table 1). The province's rural citizens rely mainly on smallholder agriculture for their survival. The potential for agriculture is impacted by the low annual rainfall, which ranges from 500 to 850 mm. The majority of smallholders farm individually and the land size

of the farms ranges from 0.1 to 10 ha. Those who live outside the schemes often possess larger landholdings. Although farmers can lease land under various terms (subordinated or unsubordinated), the land is frequently owned on a permit-to-occupy basis [15]. The dataset for this study was compiled as part of a Water Research Commission (WRC) project. The data were collected between September 2014 and June 2016.

Table 1. The number of farmers interviewed in the four irrigation schemes, KwaZulu-Natal.

Irrigation Scheme	Frequency	Percentage
Makhathini	155	46.69
Ndumo B	70	21.08
Bululwane	52	15.66
Tugera Ferry	55	16.57
Total	332	100

Source: Field Survey (2016).

3.2. Cabbage Enterprise

Although it is grown all over the country, cabbage is particularly popular in Mpumalanga and KwaZulu-Natal (KZN) provinces'. At ideal temperatures of 18–20 °C and with water requirements of roughly 380–500 mm, the crop thrives best in an environment that is both cold and wet [34]. Cabbage was selected in this study since the majority of it is produced for local use, and chain stores, informal markets, and national fresh produce marketplaces all serve as its primary distribution channels [35].

3.3. Empirical Model

3.3.1. Estimation of Market Orientation Index (MOI)

In a semi-commercial system, where both the market and domestic consumption have a substantial impact on production decisions, not all agricultural products are equally marketable [31]. As a result, depending on their resource endowment (land, labour, and capital), households may have different market orientations. The following formula was used to calculate a crop-specific marketability index (α_k)—proportion of total production a crop sold—based on the percentage of the total quantity sold:

$$\alpha_k = \frac{\sum_{i=1}^{N} S_{ki}}{\sum_{i=1}^{N} Q_{ki}}; Q_{ki} \geq S_{ki} \text{ and also } 0 \leq \alpha_k \leq 1 \quad (1)$$

where α_k is the ratio of farmer i's crop k quantity sold (S_{ki}) to the overall amount produced (Q_{ki}); this number might range from 0 to 1. Crops mainly used for household consumption will typically have α_k values closer to 0, whereas crops primarily sold would typically have α_k values closer to 1.

The farmer's market orientation index (MOI_i), which is generated from the land allocation choice of the household weighted by the marketability index of each crop (α_k) given from Equation (1), is computed following the computation of the crop-specific marketability index:

$$MOI_i = \frac{\sum_{k=1}^{K} \alpha_{ki} L_{ik}}{{L_i}^T}; {L^T}_i > 0 \text{ and also } 0 \leq MOI_i \leq 1 \quad (2)$$

where MOI_i is the market orientation index of household i, L_{ik} amount of land allocated to crop k, and ${L^T}_i$ is the total cropland operated by household i. The higher the proportion

of land a household allocates to the more marketable crops, the more the household is market-oriented.

3.3.2. Product Market Participation

According to [4,31,36,37], product market participation in annual crops was calculated as the ratio of the crop's sales value to the crop's total value of production after imputing the portion that was not sold. This index is referred to in this paper as the crop output market participation (COMP) index. It is expressed as follows:

$$COMP_i = \frac{\sum_{k=1}^{K} \overline{P_k} S_{ik}}{\sum_{k=1}^{K} \overline{P}_k Q_{ik}} \quad (3)$$

where S_{ik} is the quantity of output k sold by household i evaluated at an average prevailing price level ($\overline{P}_k$), Q_{ik} is the total quantity of output k produced by household i.

3.3.3. Specification of the Two-Limit Tobit Regression Model

In this study, the values of the dependent variables in both indices have the values cluster at the limit sources that range between 0 and 1 (0 for subsistence farmers and 1 for fully market-oriented or market participant farmers). The two-limit Tobit model is appropriate for this study as none of the indices have values below 0 and above 1 [32,38–40]. Such studies have estimated a regression line using both observations at and above the limit, and they are often preferred to other strategies that solely employ observations above the limit. Thus, it is determined that in these circumstances, the two-limit Tobit model [3] is more appropriate. However, this model has some drawbacks. The predicted values of y are constrained to the unit interval solely in the two-limit Tobit model. However, that model can only be applied when observations are within both limits, which is the case in our dataset.

The two-limit Tobit regression model is specified as:

$$y_i{}^* = \beta' x_i + \varepsilon_i \quad (4)$$

where $y_i{}^*$ is a latent variable which is unobserved for values less than 0 and greater than 1, representing the market participation or orientation indices; x_i is a vector of independent variables affecting the level of market participation or orientation; β' is a vector of unknown parameters to be estimated; ε_i is a disturbance term assumed to be normally distributed with zero mean and constant variance σ^2; and $i = 1, 2, 3, \ldots\ n$ (n is the number of observations).

Following [41], the two-limit Tobit model was defined as

$$Y^*{}_{iCOMPorMOI} = \delta_0 + \sum_{j=i}^{n} \delta_j z_{ij} + \mu_i \quad (5)$$

where Y^* is the latent variable representing the *COMP* and *MOI* scores ranging from 0 to 1, and $\delta_0, \delta_1, \ldots, \delta_n$ are parameters to be estimated. In addition, z_i are factors that influence both *COMP* and *MOI* while μ_i is an error term with mean zero and variance δ^2 ($\mu_i \sim IN(0, \delta^2)$). Therefore, the two-limit Tobit model can be presented as follows:

$$Y_i \begin{cases} 1 & Y_i{}^* \geq 1 \\ Y_i{}^*, \text{ if } 0 < Y_i{}^* < 1 \\ 0 & Y_i{}^* \leq 0 \end{cases} \quad (6)$$

Following [42], the two-limit Tobit model allows for censoring in both tails of the distribution. Therefore, the log-likelihood that is based on the double-censored data and built up from sets of the two-limit Tobit model is expressed as:

$$LnL = \sum_{y_i=1_{01}} \ln\phi\left[\frac{L_{0i} - X_i'\beta}{\sigma}\right] + \sum_{y_i=y_i^*} \ln\frac{1}{\sigma}\phi\left[\frac{Y_i - X_i'\beta}{\sigma}\right] + \sum_{y_i=L_{1i}} \ln\left[1 - \phi\left(\frac{L_{1i} - X_i'\beta}{\sigma}\right)\right] \quad (7)$$

Since there are three primary conditional expectations of interest in the Tobit model, which is different from the situation with OLS coefficients, it is challenging to interpret the calculated Tobit model coefficients as marginal effects. These are, in order, the conditional expectations of the underlying latent variable (y^*), the conditional expectations of the observed dependent variable (y), the conditional expectations of the uncensored observed dependent variable ($y \mid y > 0$), and finally the conditional expectations of the observed dependent variable. The marginal impacts of these conditional expectations are presented in [40,42,43], respectively.

$$\frac{\partial E(y^*/x)}{\partial x} = \beta \quad (8)$$

$$\frac{\partial E(y/x)}{\partial x} = \beta\Phi\left(\frac{x\beta}{\sigma}\right) \quad (9)$$

$$\frac{\partial \Pr(y > 0/x)}{\partial x} = \phi\left(\frac{x\beta}{\sigma}\right)\frac{\beta}{\sigma} \quad (10)$$

3.3.4. Estimation of Ordinary Least Square (OLS) Regression Model

Ordinary least square (OLS) was used to examine the determinants of gross income obtained from selling the cabbage output at the market. The gross income was used against gross margin as most of the inputs used by farmers had no significant variation. Moreover, the total costs of inputs used (seedling, fertilizer, pesticides, herbicides, and transport costs) were less likely to affect the gross income of farmers as the amount of output targeted was small. Cabbage gross income (*CI*) is modelled as a function of production (*P*), socioeconomic (*SE*), marketing (*M*), and institutional (*I*) factors, cabbage output market participation (*COMP*), and market orientation (*MOI*) (Tables 2 and 3).

$$CI = f\ (P, SE, M \text{ and } I, COMP, MOI) \quad (11)$$

Table 2. Descriptive statistics for continuous variables.

Variables	Description and Measurement	Mean	Std.Dev	Min	Max
* LAND_CABBAGE	Size of land allocated for cabbage production (ha)	0.55	0.85	0	5
FERTILIZER	Quantity of Basal fertilizer applied (Kg/ha)	97.26	93.16	0	350
MANURE	Quantity of manure applied (Kg/ha)	54.53	93.92	0	750
PESTICIDES	Quantity of pesticides applied (Litres/ha)	7.72	21.29	0	200
LABOUR	Number of labour/ha employed	17.21	28.44	0	241
AGE	Age of a farmer	49.40	12.51	19	87
EDUCATION	Education level of a farmer (years)	4.59	4.52	0	15
HOUSEHOLD_SIZE	Household size (Number of members in the household)	7.26	4.59	1	38
EXPERIENCE_FARMING	Farmer's experience in farming (years)	15.65	12.60	0	59
IRRIGATION_YEARS	Farmer's experience in irrigation	9.98	10.78	0	50
DISTANCE_MARKET	Distance from the farm to the market (walking minutes)	13.28	15.84	0	120
* QUANTITY_CABBAGE	Output produced-quantity of cabbage (Kg)	4030.50	7135.74	20	8300
QUANTITY_SOLD	Quantity of cabbage sold (Kg)	3630.47	6525.83	0	51,600
CABBAGE_PRICE	Selling price of cabbage (Rands/Kg)	4.97 [1]	2.00	1.5	16.67
** COMP	Crop output market participation index	0.83	0.25	0	1
** MOI	Market orientation index	0.38	0.34	0	0.43
** CABBAGE_INCOME	Gross income from selling cabbage (Rands)	17,668.69 [1]	35,774.36	0	290,000

Source: Field Survey (2016). Notes: * Only for descriptive purposes, ** Outcome variable used in the two-limit regression model in the following sections. [1] USD = ZAR 14.5 (South African Rand) at the time of the data collection (June 2016). This exchange rate has been used in the entire study.

Table 3. Descriptive statistics for categorical variables.

Variable	Description	Mean	SD
GENDER	Farmer gender (1 = Male; 0 = otherwise)	0.33	0.47
TYPES OF IRRIGATION SYSTEMS	Types of irrigation systems used (1 = Sprinkler, 0 = Otherwise)	0.49	0.50
MARITAL STATUS	Farmer's marital status (1 = Married, 0 = otherwise)	0.45	0.50
MAIN OCCUPATION	Farmer's main occupation (1 = Full time farmer, 0 = Otherwise)	0.87	0.34
TYPES OF MARKET	Type of the market where the crops are sold (1 = Hawkers, 0 = Otherwise)	0.33	0.47
SOCIAL GRANT	Social grant receiver (1 = Yes, 0 = Otherwise)	0.83	0.37
GROUP MEMBERSHIP	Farmers are members of informal groups (1 = Yes, 0 = No)	0.55	0.50

Source: Field Survey (2016).

4. Results and Discussions

4.1. Descriptive Statistics

Table 2 presents the description of continuous variables used in the empirical analysis.

Among the survey respondents, as shown in Table 2, the mean of land allocated for cabbage production was 0.55 ha while the quantities of basal fertilizer and manure applied were 97.3 Kg/Ha and 54.5 Kg/ha, respectively. This implies that smallholder cabbage farmers use chemical fertilizer more as compared to manure. In addition, the mean pesticide use was 7 Litres/Ha while the total number of labourers used in all activities from land preparation to harvesting was 17. Moreover, the mean age for farmers was 49 years, indicating that most farmers are adults. Their mean education level was 5 years of primary school. The mean size of the household was also seven members and farmers had an experience of 15 years which also implies that they are more familiar with cabbage farming.

The mean years of farmers' experience in irrigation schemes were found to be 9 years while the mean distance from the farm to the nearest market is 13 Km. In addition, the mean cabbage quantity/output produced was 4030.5 Kg while the average quantity sold was 3630.47 Kg. Smallholder farmers sold 83% of the cabbage they produced, underscoring relatively high level of market participation. However, the market orientation was 0.38 (38%), indicating that farmers are less market-oriented. Furthermore, the average selling price for cabbage was found to be ZAR 4.97 which brought the mean cabbage income of ZAR 17,668.69 per season.

4.2. Descriptive Statistics of Categorical Variables

Table 3 presents the descriptive statistics for categorical variables used in the empirical analysis.

The findings indicate that, on average, 33% of the respondents interviewed were male smallholder farmers, implying that the majority are women. In addition, the results show that the majority of the respondents were engaged fully in farming as their main occupation (87%). Moreover, 45% of the respondents were married. Marriage restricts mobility and positively influences motivation to put more effort into farming. Almost 50% of the farmers used a sprinkler irrigation scheme with 83% receiving social grants. About 55% were members of a farmers' group. In addition, the majority of farmers sold their cabbage produce to hawkers (33%). The majority of street vendors in South Africa are located in the KwaZulu-Natal (KZN) province, specifically in the Durban region. Additionally, the research by [44–46] revealed that chain stores, processors, restaurants, hawkers, and the fresh produce market all sell fresh cabbage.

4.3. The Distribution of Market Participation and Orientation Indices

Table 2 indicates that the average cabbage output market participation is 0.83 (83%) which implies that cabbage farmers in the study area are participating well in the marketing of their produce. Moreover, the majority of farmers were in the range of 0–81, followed by

0.61–0.80 and 0–0.2, which were 75%, 15.1%, and 7.2%, respectively (Figure 2). However, the average market orientation index is 38% (Table 2), implying that cabbage farmers are not market-oriented.

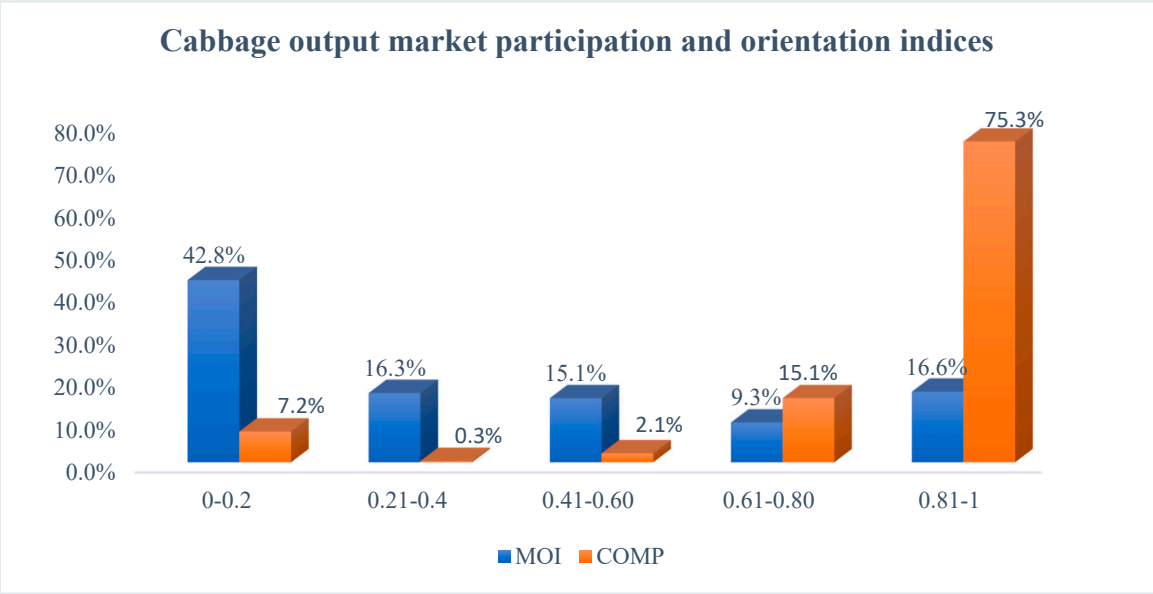

Figure 2. Distribution of cabbage market participation and orientation indices. Source: Field Survey.

It further suggests that, during the production period, farmers are not making production decisions targeting the market. This can further be shown by the ratio between the available amounts of total land they possess compared to the amount of land they allocate to cabbage production (Table 2), which suggests that cabbage farmers are not producing taking into account market signals. The findings (Figure 1) also indicate most of the farmers' market orientations were in the range of 0–0.2, followed by 0.2–0.4, 0.4–0.6, and 0.61–0.8 which were 42.8%, 16.3%, 15.3%, and 9.3%, respectively. Therefore, since cabbage output market participation is higher than the market orientation index, it may be further suggested that market orientation does not necessarily translate into market participation. This might be due to production challenges that farmers are facing, such as poor quality services and high cost of inputs, high transportation costs, unreliable market information, and challenges of smallholder farmers in coping with agricultural markets [47,48]. Thus, the market orientation of smallholder farmers remains low due to the prevailing practical constraints and perceived mindset challenges.

Moreover, in the context of farmers in KwaZulu-Natal, another possible reason for participating more in the market while being less market-oriented is family responsibilities, which influences them to opt for selling the crop to access quick income to meet pressing household needs. The result is that farmers are driven to sell their products to pay for basic household expenses, such as food, utilities, and school fees. According to [49], based on the resources, social and economic conditions, and government policies, various rural population groups react to the process of commercialization differently.

4.4. Determinants of Cabbage Market Participation

Table 4 presents the results of the Tobit regression model. The value of chi-square (Pro > chi^2 = 0.0016) shows that the model is significant. In addition, the there was no multicollinearity as the variance inflation factor (VIF) was less than 10 on average, Moreover, robust standard errors were generated to address heteroscedasticity [33].

The factors FERTILIZER and MANURE were discovered to be statistically significant and negatively affecting participation in the cabbage market. This suggests that as the usage of chemical fertilizer and manure increases, so do productivity and quantity produced.

However, the increase in the usage of fertilizer and manure implies an increase in the costs of production as farmers will need to purchase them in large quantities, which ultimately lowers market participation for cabbage. The HOUSEHOLD SIZE variable was statistically significant and positively influenced market participation for cabbage output. Others (such as [50–52] has indicated that as household sizes rise, farmers are forced to use most of what they produce to meet household requirements remain with less marketable surplus. This finding runs counter to those studies' findings. The majority of smallholder farmers, according to [53], produce more than is necessary to ensure the food security of their households, and the surplus is then sold to pay for other non-food products. Therefore, a rise in household size would increase the size of the farm, increasing the amount of agricultural produce available for sale. Large families are able to produce more food for their needs and still have extra to sell.

Table 4. Determinants of cabbage market participation.

Variables	Coefficients	Marginal Effects	Robust Std. Err.	t	$p > t$
Production factors					
FERTILIZER	−0.00002	−0.00002	0.00001	−1.91	0.058 *
MANURE	−0.00004	−0.00004	0.00001	−2.93	0.004 **
PESTICIDE	0.00005	0.00005	0.00005	1.06	0.29
NUMBER_OF_LABOUR	−0.00008	−0.00008	0.00005	−1.54	0.125
IRRIGATION_TYPE	0.00096	0.00096	0.03170	0.03	0.976
Socioeconomic factors					
MARITAL_STATUS	−0.00015	−0.00015	0.03423	0	0.996
AGE	−0.00091	−0.00091	0.00171	−0.53	0.593
EDUCATION	0.00033	0.00033	0.00397	0.08	0.933
HOUSEHOLD_SIZE	0.00582	0.00582	0.00351	1.66	0.098 *
EXPERIENCE_FARMING	−0.00054	−0.00054	0.00170	−0.32	0.752
IRRIGATION_YEARS	0.00184	0.00184	0.00172	1.07	0.287
GENDER	0.01941	0.01941	0.03345	0.58	0.562
Marketing and institutional factors					
DISTANCE_MARKET	0.00134	0.00134	0.00099	1.35	0.177
CREDIT	0.02722	0.02722	0.03313	0.82	0.412
CABBAGE_SELLING_PRICE	0.00935	0.00935	0.00814	1.15	0.252
GROUP_MEMBERSHIP	−0.03304	−0.03304	0.03219	−1.03	0.306
SOCIAL GRANT	−0.02455	−0.02455	0.04292	−0.57	0.568
MARKET_TYPE	−0.02630	−0.02630	0.03395	−0.77	0.439
_cons	0.83501		0.11130	7.5	0.000
Number of obs	327				
LR $chi^2(18)$	40.82				
Prob > chi^2	0.0016				
Pseudo R^2	0.1776				
Log-likelihood	−94.477				

Notes: **, and * are significant at 5% and 10% levels, respectively. Source: Field Survey.

4.5. Determinants of Farmers' Market Orientation

Table 5 presents the Tobit regression model of the determinants of market orientation by smallholder cabbage farmers. The value of chi-square (Pro > chi^2 = 0.000) shows that the model is significant. In addition, there was no multicollinearity as the variance inflation factor (VIF) was less than 10, on average, Moreover, robust standard errors were generated to address the problem of heteroscedasticity [54].

The findings demonstrate that the variables FERTILIZER, MANURE, and NUMBER OF LABOUR were statistically significant and negatively influenced farmers market orientation for cabbage. This suggests that as the use of these agro-inputs increases, farmers are becoming less focused on the market. On the other hand, market-oriented farmers are better at choosing inputs, which lessens the causal ambiguity as to why such farmers do better than traditional farmers, according to [9,55]. Additionally, it was discovered that a farmer's education (EDUCATION) positively and statistically significantly influenced

his/her market orientation among cabbage growers [56]. Their likelihood of employing advanced and enhanced inputs, which can increase cabbage output, may be influenced by education. The study by [36], which came to the conclusion that an individual farmer with a higher level of education is more market-oriented, is compatible with this finding. Additionally, farm performance increases with increased levels of education [57]. One explanation could be that using the most modern tools effectively requires specialized training and manual reading to generate a product with a higher market value.

Table 5. Determinants of market orientation among small-scale cabbage farmers.

Variables	Coefficients	Marginal Effects	Robust Std. Err.	T	$p > t$
Production factors					
FERTILIZER	−0.00003	−0.00003	0.00001	−2.680	0.008 **
MANURE	−0.00004	−0.00004	0.00002	−2.480	0.014 **
PESTICIDE	−0.00001	−0.00001	0.00006	−0.230	0.818
NUMBER_OF_LABOUR	−0.00021	−0.00021	0.00007	−3.280	0.001 ***
IRRIGATION_TYPE	0.00260	0.00260	0.03729	0.070	0.944
Socioeconomic factors					
MARITAL_STATUS	−0.00774	−0.00774	0.04005	−0.190	0.847
AGE	−0.00048	−0.00048	0.00198	−0.240	0.810
EDUCATION	0.00895	0.00895	0.00461	1.940	0.053 *
HOUSEHOLD_SIZE	0.00774	0.00774	0.00400	1.940	0.054 *
EXPERIENCE_FARMING	0.00439	0.00439	0.00199	2.200	0.028 **
IRRIGATION_YEARS	−0.00335	−0.00335	0.00202	−1.660	0.099 *
GENDER	0.03434	0.03434	0.03921	0.880	0.382
Marketing and institutional factors					
DISTANCE_MARKET	−0.00014	−0.00014	0.00116	−0.120	0.903
CREDIT	0.08691	0.08691	0.03874	2.240	0.026 **
CABBAGE_SELLING_PRICE	−0.01081	−0.01081	0.00931	−1.160	0.246
GROUP_MEMBERSHIP	0.07839	0.07839	0.03776	2.080	0.039 **
SOCIAL GRANT	−0.04846	−0.04846	0.05009	−0.970	0.334
MARKET_TYPE	−0.05325	−0.05325	0.03961	−1.340	0.180
_cons	0.35368		0.12919	2.740	0.007
Number of obs	327				
LR chi2(18)	74.55				
Prob > chi^2	0.0000				
Pseudo R^2	0.2374				
Log-likelihood	−119.71651				

Notes: ***, **, and * are significant at 1%, 5%, and 10% levels, respectively. Source: Field Survey.

The household size variable (HOUSEHOLD) was also statistically significant and positively influenced market orientation of the farmers. A larger household implies that a farmer has to produce more to meet family needs. Therefore, such influence might result in allocating more land for cabbage production. Moreover, more active household members are projected to increase the likelihood of investing in inputs to improve productivity [31,58]. In addition, the variable EXPERIENCE_FARMING was also found to be statistically significant and positively influencing market orientation by a farmer. Farming experience usually influences farmers' knowledge and skills in marketing activities and thus they become more market-oriented [59].

However, farmers' experience in irrigation (IRRIGATION_YEARS) was also statistically significant, implying that a farmer who is more experienced in irrigation farming is less market-oriented. This is against our expectation. Because irrigation alone will not produce a high enough yield to enable farmers to produce a marketable surplus thus other contemporary inputs will remain essential. Also, if farm households do not have access to market information for their produce, the desired outcome of accessing a better market might not be achieved [60]. The other possible reason could be many of the irrigators are in the scheme and they sell as a group therefore they are not worried about market during the

farming process. In addition, farmers may be producing mainly for the family needs and hence less entrepreneurial.

The findings also demonstrate that access to formal credit (CREDIT) has a statistically significant impact on market orientation in a negative way. Farmers' market orientation is influenced by their ability to access modern agricultural inputs through finance. According to [5], expanding credit availability is frequently seen as one of the most important factors in raising agricultural productivity. This has been widely regarded as an effective strategy to boost smallholder productivity and give them access to better markets for their produce. Furthermore, having access to credit improves the welfare of farmers since it increases production and net income compared to those who lack credit [61].

Nevertheless, being a member of a farmers' group (GROUP_MEMBERSHIP) was also statistically significant and positively influenced market orientation. Membership in different groups facilitates information and knowledge exchange which, in turn, improves market orientation. Access to finance, extension services, and group input purchases are made easier by group membership [62,63]. To reach a large number of targeted farmers and lower transaction costs, farmer groups have also evolved into entrance points for non-governmental organizations (NGOs) and other organizations promoting agricultural development [49].

4.6. Determinants of Cabbage Income per ha

Table 6 below presents empirical model estimates to explain farmers' income from selling cabbage. The overall significance and fitness of the model have a value of chi-square (Pro > chi^2 = 0.000), which suggests that the model is significant. In addition, there was no multicollinearity as the variance inflation factor (VIF) was less than 10, on average.

The findings demonstrate that the three inputs—manure, pesticides, and the number of workers—were statistically significant and had a favourable impact on cabbage income. This result is consistent with [64]. Both refs. [65,66] noted that productivity increases can be achieved by reallocating resources or by intensifying the usage of inputs such as fertilizer, herbicides, and seeds. Given the rise in production, *ceteris paribus*, it is expected that farmers will sell the surplus after meeting household food needs.

The cabbage selling price (*CABBAGE_SELLING PRICE*) was found to be statistically significant and positively influencing the income from selling cabbage. This confirms that what matters most is not access to markets but the price that farmers receive. The price they receive, in turn, is a function of 'who the buyer is', 'which market it is sold', and/or 'where they sell it'. Farmgate prices are generally low as the buyers are taking advantage of small farmers' dire need for cash, the perishability of the products, and lack of access to transport their products to profitable markets. Low prices of farm output and high prices of inputs depressingly impact farm income [67,68]. The findings also show that the cabbage market participation index (*COMP*) is statistically significant and positively influences farmers' income. This indicates that the better farmers participate in the market, the more income they earn, and *vice versa*. Among others, ref. [69] have also shown that the extent of farmers' participation in markets partly determines their productivity, and hence their earnings. This implies that farmers' income will increase with market participation, and thereafter portion of the extra income might also be used for purchasing better inputs, which will again influence productivity and hence the marketable surplus. Moreover, knowledge of prevailing prices may not necessarily guarantee farmers' market participation, especially when buyers determine market prices and transaction costs are high [10].

Improved market connections may persuade rural residents to view farming as a lucrative and hence viable source of income. However, the market orientation index (*MOI*) was not found to be statistically significant in explaining cabbage income per ha. Again what matters for smallholder farmers is market participation, not so much market orientation. Market orientation does not affect farm income unless it translates to market participation.

Table 6. Determinants of farmers' income per ha.

Variables	Coefficients	Std. Err.	t	$p > t$
Production factors				
COMP	12.8158	7.0627	1.81	0.071 *
MOI	−8.7424	5.3420	−1.64	0.103
FERTILIZER	−0.0007	0.0008	−0.82	0.412
MANURE	0.0041	0.0013	3.07	0.002 **
PESTICIDE	0.0427	0.0051	8.35	0.000 ***
NUMBER_OF_LABOUR	0.0231	0.0056	4.13	0.000 ***
IRRIGATION_TYPE	0.3970	3.3375	0.12	0.905
Socioeconomic factors				
MARITAL_STATUS	0.8598	3.5951	0.24	0.811
AGE	0.1027	0.1788	0.57	0.566
EDUCATION	0.1218	0.4172	0.29	0.771
HOUSEHOLD_SIZE	0.1739	0.3650	0.48	0.634
EXPERIENCE_FARMING	−0.2030	0.1800	−1.13	0.26
IRRIGATION_YEARS	−0.1778	0.1826	−0.97	0.331
GENDER	−0.9634	3.5307	−0.27	0.785
Marketing and Institutional factors				
DISTANCE_MARKET	−0.0031	0.1052	−0.03	0.977
CREDIT	−1.5523	3.5104	−0.44	0.659
CABBAGE_SELLING_PRICE	2.0947	0.8432	2.48	0.014 **
GROUP_MEMBERSHIP	0.9731	3.4361	0.28	0.777
SOCIAL GRANT	−2.113168	4.54097	−0.47	0.642
MARKET_TYPE	0.948109	3.579589	0.26	0.791
_cons	2.039741	13.00145	0.16	0.875
Number of obs	327			
F(20, 306)	7.82			
R-squared	0.3382			
Adjusted R-squared	0.2950			
Root MSE	29.165			

Notes: ***, **, and * are significant at 1%, 5%, and 10% significance levels, respectively. Source: Field Survey.

In sum, in smallholder agriculture, market participation is by and large a function of marketable surplus, not market orientation. This is in sharp contrast with commercial farmers where market orientation is the key for market participation. When making production decisions, most smallholders are not doing so considering market signals. That is why they end up not benefitting from the market they participate in. Market orientation will then become the unintended outcome of their continuous engagement with the market.

5. Conclusions and Policy Recommendations

Agriculture contributes to the majority of livelihoods in Africa through income gained from the selling of agricultural crops. This study has empirically examined the linkage between cabbage output market participation and market orientation in explaining farmers' income. The study found that market participation is more important in explaining farmers' income as compared to market orientation. Moreover, even though it translates to market participation, socioeconomic factors (such as education, household size, and farmers' experience) influence both market orientation and participation.

In South Africa's smallholder agriculture, market participation is mainly a function of marketable surplus, not market orientation. This is in sharp contrast with commercial farmers. When making production decisions, unlike commercial farmers, smallholder farmers are not accounting for market signals. That is why they end up not benefiting from the market. Market participation will, however, have the unintended outcome on their mindset in terms of enhancing their market orientation in the future.

Furthermore, institutional factors (such as access to credit and group membership) play a significant role in market orientation, but market participation is not influenced

by any of these factors. On the other hand, allocating less land to cabbage suggests that farmers might be allocating the remaining land to other crops such as maize, tomatoes, and beans. It might also be due to financial constraints in utilizing the total land they operate for cabbage production. This distinction might be influenced by socioeconomic, institutional, and production factors.

The government and other interested parties should place a greater emphasis on ensuring that modern agricultural inputs are available because they appear to be important variables in both market orientation and participation. In an effort to keep farm costs low and production high, this can be accomplished by providing subsidies for agricultural inputs. Additionally, the availability of better-quality inputs and input support programs affect production/productivity, market orientation and participation. In this context, since the institutional factors only affect market orientation, most of the designed policies should also pay more attention to the production side, where a farmer has to be enabled to be more market-oriented as this will eventually influence the degree of market participation. This can be accomplished by providing credit to farmers via electronic input vouchers as well as by coordinating with input providers to guarantee sufficient stock levels and reasonable prices. In addition, it is important for government to create a more conducive environment and supporting strategies for farmers to participate in the market with the objective of improving their income. Such strategies include building partnerships with the private sector and establishing/strengthening farmer organisations such as farmers' groups to produce more. In addition, since the selling price was also a significant factor in the farmers' income, the government and other stakeholders/partners need to invest (on transport infrastructure, storage infrastructure, and collective institutional arrangements) to enable small farmers access profitable markets.

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