CHAPTER FIVE

DETERMINANTS OF MARKET PARTICIPATION

5.1 INTRODUCTION

The descriptive results presented in Chapter 4 showed the characteristics of households participating in different commodity markets. It was evident that households producing high-value commodities such as horticulture and livestock were more commercially oriented, while those producing maize and other field crops were less commercially oriented.

The objective of this chapter is to present the empirical results of the model formulated in Chapter 3. The model is designed to present the factors that determine market participation. As such the chapter analyses various transaction costs factors and their respective influence on the household's decision to sell, and also the level of sales. It attempts to answer two questions:

1. What determines the decision to participate in agricultural markets?
2. What determines the level of participation in such markets?

5.2 ESTIMATING THE MODEL

5.2.1 Estimation procedure

The aim of the study is to look at factors that increase the level of participation in the market. Ideally, the OLS model is applicable when all households participate in the market. In reality not all households participate. Some households may not prefer to participate in a particular market in favour of another, while others may be excluded by market conditions. If the OLS regression is estimated excluding the non-participants from the analysis, a sample selectivity bias is introduced into a model. Such a problem is overcome by following a two-stage procedure as suggested by Heckman (1979) or tobit procedures. These procedures has been discussed broadly in Tobin (1958), Hanushek *et al* (1977),

Greene (1981, 1993), Kmenta, (1986), Maddala, (1988, 1992), Judge *et al* (1988) and Gujarati (1995) and applied in several instances (Goetz, 1995; Fenwick, 1998; Nkonya *et al*, 1997).

5.2.1.1 Two-step selectivity procedure

The first step (or stage) of the procedure involves establishing the probability of participation in the output market by estimating a probit model. Following Goetz (1992) we can reasonably hypothesize that at least some households are prevented from selling because they face high transaction costs. Define $s_{ik} = 1$ fro households which sell commodity k and $s_{ik} = 0$ otherwise, and s_{ik}* denote the unobserved desired propensity to sell. For the *n* observations sample suppose there are *m* observations for which participation is positive ($s^* > 0$), the rest of s and ε being truncated. The conditional expectation of s given $s^* > 0$ is

$$E(S/s^* >0) = \alpha + \beta X + E(\varepsilon | s^* > 0)$$

$$= \alpha + \beta X + E(\varepsilon \mid \varepsilon^* > -\alpha - \beta X).$$

Given that $\varepsilon^* \sim N(0, \sigma^2)$, the mean of the corresponding truncated variable, ε, is

$$E(\varepsilon \mid \varepsilon^* > -\alpha - \beta X) = \sigma\lambda$$

Where

$$\lambda = f\left(\frac{\alpha + \beta X}{\sigma}\right) / F\left(\frac{\alpha + \beta X}{\sigma}\right),$$

and $f(\cdot)$ represents the density and $F(\cdot)$ the cumulative distribution function of a standard normal variable. To allow for nonzero mean of ε, the regression equation for *m* observations for which $s^* > 0$ can be written as

$$s = > -\alpha + \beta X + \sigma\lambda + \varepsilon^* \qquad (26)$$

The indicator λ is not observable, but it can be consistently estimated by forming a likelihood function for the binary variable in the probit model. As such the first step (probit model) provides estimates of $(\alpha + \beta X)/\sigma$ and, thus λ.

Normally, the second step involves applying OLS using observations for which $s > 0$ in the regression model to be estimated. The OLS regression (or Heckit) coefficient for λ will be statistically significant if sample selectivity bias occurs,

while the remaining variables will be consistent (Heckman, 1979; Goetz, 1995; Fenwick and Lyne, 1998).

Following Maddala (1992:159), instead of using only the nonzero observations on s_{ik}, if we use all the observations, we get

$$E(s_{ik}) = Pr(s_{ik} > 0) \cdot E(s_{ik} / s_{ik} > 0) + Pr(s_{ik} = 0) \cdot E(s_{ik} / s_{ik} = 0)$$

$$= F(\cdot)_i [\alpha + \beta X + \sigma\lambda] + [1 - F(\cdot)_i] \cdot 0$$

$$= F(\cdot)_i [\alpha + \beta X] + [\sigma f(\cdot)_i] \quad (27)$$

After getting estimates of $f(\cdot)_i$ and $F(\cdot)_i$, we can estimate equation (27) by OLS. The threshold value in equation (27) is zero, thus not applying a very restrictive assumption. The components of equations (26) and (27) consist of two terms making total effects of the whole sample. The first component is the direct effect of the explanatory variables of those households participating in the market. The second component is the effect of the inverse mills ratio based on all the observation.

5.2.1.2 Tobit estimation procedure

Data providing for market participation tend to be censored at the lower limit of zero. That is, the household may sell some of its produce, while another may not sell at all. If only probability of selling to be analysed, probit or logit models would be adequate techniques for addressing probability questions.

Although it is interesting to know factors that influence the level of sales, at the same time, there is a need for a model that is a hybrid between the logit or probit and the OLS. The appropriate tool for such is the tobit model that uses maximum likelihood regression estimation (Tobin, 1958, Kmenta, 1986; Gujarati, 1995). A tobit model answers both of the following questions:

What factors influence the probability of selling? This question is answered by logit and probit.

What factors determine the level or magnitude of sales? This question is not answered by logit and probit models, but by OLS.

The variable indicating the proportion of income contributed by agriculture is continuous but has a limited distribution that is censored. The Tobit model is specified in Maddala (1992), Hobbs (1997) and ESI (1999) as follows:

$y^* = \beta' x + \mu$

where y^* is the latent variable (level of sales), and x is a vector of independent factors, and μ is the error term. The observed sales can be denoted as,

$$y = L_0 \text{ if } y^* \leq L_0$$
$$= y^* \text{ if } y^* > L_0 \qquad (28)$$

where L_0 is the unobserved lower limit of zero (i.e. selling is zero). The likelihood function for this model is

$L(\beta, \sigma \mid y, x, L_0) =$

$$= \prod_{y_i = L0} \Phi\left(\frac{L_0 - \beta' x}{\sigma}\right) \prod_{y=y^*} \tfrac{1}{\sigma}\phi\left(\frac{y - \beta' x}{\sigma}\right) \qquad (29)$$

Where $\prod_{y=L0}$ is the product over L_0 lower limit observations of smaller or no sales, $\prod_{y=y^*}$ is the second product over the non-limit observations reflecting different level of sales.

After maximising the log of (29) to calculate the effects of changes in explanatory variables on the dependent variable, the expectation of y can be derived. The conditional expectation of y, based on the information that y^* lies above the limits, is

$$E(y \mid y^* > L_0) = \beta' x + E(\mu \mid L_0 - \beta' x < \mu) = \beta' x + \sigma \frac{\phi}{\Phi} \qquad (30)$$

where $\Phi = \Phi\left[\left(L_0 - \beta' x\right)/\sigma\right]$ with corresponding definition for ϕ_1.

The unconditional expectations of y without restricting y^* to lie below the lower limit, is

$$E(y) = P(y = L_0) \cdot L_0 + P(y^* > L_0) \cdot E(y \mid y > L_0)$$
$$= \Phi\ L_0 + \beta' x \Phi\ + \sigma\phi \qquad (31)$$

Substitution in the values for L_0 (zero), the effect of changes in the explanatory variables on the dependent variable becomes

$$\frac{\partial E(y)}{\partial x} = \Phi \hat{\beta} = (prob[y^* > 0])\hat{\beta} \qquad (32)$$

Equation (32) gives the marginal effects of changes in the explanatory factors on the sales, given the censoring of the dependent variable. The effect of a change in the explanatory factors on level of sales consists of two parts. Firstly, it is the change in the dependent variable of those observations over the limits, weighted by the probability of being over the limits. Secondly, the change in the probability of being above the limits, weighted by the expected value of the dependent variable if above the limits (Kennedy, 1993; Hobbs, 1997).

5.2.1.3 Heckit and tobit results

The basic motive in this study is to apply a procedure that compensates for the fact that a large number of households do not participate in markets. Both heckit and tobit procedures address this concern, as indicated earlier. The heckit procedure is a consistent but not an efficient way to control for selectivity bias, while tobit procedure is efficient and consistent. Technically, if heckit specification was run using maximum likelihood estimation procedure without lambda, the results would be identical to tobit-MLE selection models with iterations constrained to one.

The results obtainable from the tobit procedure are the MLE or maximum likelihood estimates, as well as the marginal effects. As discussed in the earlier section, the marginal effects indicate the amount of the sales resulting form a unit change in the explanatory variables. The marginal effects account for the probability of being a market participant. They have the same interpretation as the OLS coefficients. It is sometimes pertinent to compare the marginal effects and OLS coefficients, though the latter are distorted. In this study the results are presented in the same table in Appendix 2, but not discussed.

In the light of the theoretical framework used in this study (to elicit the fixed and variable transaction costs) the tobit procedure seems to conceal some information. In fact, the procedure tends to combine the effects of both fixed and variable transaction costs, which is not the intent of this study. As such, the results of the tobit procedure are placed in the appendix for comparison purposes.

The two-stage selectivity procedure involves two steps - equivalent to a decomposition of transaction costs into two effects. The first step is the probit analysis that provides results to determine the probability of participating in the market (equivalent to the effects of fixed transaction costs in market participation). The second stage provides heckit analysis that determines the level of participation (equivalent to the effects of fixed and variable transaction costs). The heckit results are decomposed into direct and indirect effects. The direct effects measure the conditional results, i.e. the estimates are conditional on participation. The indirect effects are the effects of selectivity bias, based on the entire sample. Basically, they are the difference between direct and total effects. The total effects are technically equivalent to the tobit procedure with iterations constrained to one. The two-stage selectivity procedure tends to provide more relevant information for this study. The analysis will therefore be based on the results of the two-stage selectivity procedure, while the tobit selectivity results (Appendix 2) will be highlighted where necessary.

5.2.2 Variables in the model

To estimate the model in equations (26) and (27) the data collected in 1997 from 157 households is used. The dependent variable of market participation is measured by the probability and the value of output sold in the market. Four commodities are considered as pertinent in the market participation behaviour (Table 5.1). High-value commodities include *horticulture* and *livestock*. These commodities, in particular, need to be promoted as the South African Government continues its efforts to create viable smallholder commercial farmers. Other commodities are mainly *food crops* such as maize, which are important for food security. *Field crops* include wheat, beans, grain sorghum and some more.

For each of the four commodities (or commodity groups) there are two dependent variables: the first indicates whether the household participates in the market or not. The indicator variable gets the value of one if the household participates, and it is zero otherwise. For those who participate, the second variable indicates the value of output marketed constitutes the level of participation. To determine

factors affecting the two processes for each commodity, a number of explanatory variables are specified to reflect the effect of transaction costs.

These explanatory variables are divided into three constructs: access to information, access to assets (or household endowment), and household structure. The quality of the decisions made by the households depends on their information base. *Access to information* tends to improve decision-making skills. These, then, affect the probability of market participation since information service never lowers the expected utility (Nicholson, 1992 and Rauniyar, 1990). Thus, the more information the household has on marketing, the less would the transaction costs be – thus increasing market participation. *Access to assets* provides households with leverage to invest in market participation. Access to assets is an indication of endowment and wealth. Generally, the more endowed households tend to experience lower transaction costs and have more flexibility in allocating resources to market activities. The *household structure* tends to capture a number of possible concepts of household behaviour. In market participation these may reflect the attitude of farmers towards risk. Risk associated with market participation is caused by price and quantity fluctuations. The attributes of household structure allowing for risk-taking are related to creating the possibilities of lowering transaction costs.

Table 5.1: Dependent and independent variables used in the models

Dependent Variables	Model Description
1. Horticulture market	• Probability of selling horticulture crop (HORTMKT) • Value of horticultural crops sold (HORTVALU)
2. Livestock market	• Probability of selling livestock (LIVSTMKT) • Value of livestock sold (LIVSTVAL)
3. Maize market	• Probability of selling maize (MAIZMKT) • Value of maize sold (MAIZVALU)
4. Other field crops market	• Probability of selling other field crops (FCROPMKT) • Value of other field crops sold (FCROPVAL)
Independent Variables	
Household Endowment (Assets)	• Size of arable land (Ha) • Value of livestock owned (R) • Pensions earned (R) • Non-farm earnings (R) • Ownership of vehicle or tractor (yes = 1)
Access to Information	• Farming learnt through extension (yes = 1) • Average household education (years) • Distance to nearest town (km) • Road conditions to nearest town (1 if good)
Household Characteristics	• Gender of household head (1 if female) • Age of household head (years) • Household size (number of people in AE)
Interaction Factors	• Proximity and road conditions to nearest town • Average education and non-farm income

The construct of access to information consists of contact with extension officers, basic average education, proximity to markets, and other location variables such as road conditions. Contact with extension officers tends to improve farmers' access to information. Frequently, the extension officers help farmers with marketing information. As such, in the marketing of most commodities, and horticulture is one of them; contact with extension officers is crucial in order to make the decision to participate in the market. The contact, however, will not necessarily influence the level of participation.

This variable was measured by asking farmers how they learnt about farming (SKOLVIST). The related variable pertained to education. Market information reaching farmers requires proper interpretation. Sometimes the information comes in English or Afrikaans. In that case, those who cannot retrieve and interpret the information have difficulties in making decisions. The variable reflecting ability to retrieve and interpret information was measured by the average education of the household (AVER-EDU).

The other variables to do with information access are location variables. The variable measuring the proximity to the nearest town (PROXIMITY) reflects how far farmers have to travel to reach sources of information. Such information sources are located in the nearest town where there are offices and markets. The closer to the markets the farmers are, the easier it is for them to obtain information about the market. A related variable is the conditions of the road to the nearest town (RCTNT). When the infrastructure is poor, farmers are generally discouraged to use it. And those who do use the infrastructure experience high costs.

The other construct of transaction costs is access to assets. This has been measured in terms of access to production assets (arable land, and livestock), investment or liquidity assets (non-farm income, pension earnings) and transportation assets (ownership of vehicle and tractor). Access to arable land and ownership of livestock is a necessary condition for market participation. The more the arable land the household has, the higher the production levels are likely to be, and thus the higher the probability of participating in the market. Access to arable land was measured in terms of the size of the land used for crop production (ARABLE LAND).

Similarly, the more livestock owned the more likely the household has a propensity to sell some livestock. The ownership of livestock was measured by the value of livestock owned by the household (LIVST100) in hundred rand units.

Liquid assets are required to provide investment in market activities, such as paying for information and transport. Access to non-farm income was measured by the amount of income from business activities, service provision, salary and

wage earning by the household members (NFARM100) in hundred Rand units. Some members of the household do not have access to non-farm income, and in some cases they receive old-age pension grants. There is a tendency for most of the households to invest such grants in farming activities. It is assumed that some households invest these sums in marketing activities in order to overcome prohibiting transaction costs. Access to pension grants was measured by amount of earnings received by the household (PENSION) in Rands. The variable reflecting access to transport facilities was measured by the household ownership of a vehicle or a tractor (TRACVEC). The variable took the value of one if the household owned a vehicle or tractor, and zero if this was not the case.

The final construct was the household structure. This was operationalised by three variables, that is, the age of the head of the household, the gender of the head of the household, and the size of the household. The age of head of the household (HHAGE) normally provides a proxy for experience in farming. Further, these farmers will have stronger social network and will have established credibility within the network. This implies that older heads are more informed about the marketing system. HHAGE was measured in number of years. The gender of the head of the household (HHGENDA) reflects the fact that female farmers will face higher transaction costs since they lack credibility as contractual parties due to the perception that courts (particularly tribal) will favour men in the event of a dispute with a woman. The variable assumed the value of one if the head was a woman and zero for male heads. The size of the household represents the productive and consumption units of the household. The more members in the household, the more complicated the internal negotiation process will be with subsequent lowered likelihood of participating in the market. The variable was measured by the number of household members in adult equivalent (HHSIZE).

A number of interaction factors are also used. The first factor involves the interaction between proximity and road conditions (DISTNRCT). When households are closer to the markets but face bad road condition, their transaction cost of participating will not necessarily be lower, thus limiting market participation. Similarly, those households having access to good road conditions, but located further away will experience high costs of market participation. It

follows that, generally speaking, those households located closer to markets with good road conditions will experience lower transaction costs – and this encourages participation. The second interaction factor is between education and non-farm income (EDUNFARM). Farmers with education but without non-farm earnings will not avoid prohibitive costs since they are able to interpret information, despite the fact that the absence of resources to invest will not ameliorate the transaction costs. On the other hand farmers who earn non-farm income, but are unable to interpret information may, equally, not experience lower transaction costs. Thus, those households with higher education levels and earning non-farm income are able to interpret information better and invest in market activities, resulting in a lowering of their transaction costs.

5.2.3 Hypotheses

The study aims to determine the effect of transaction costs on market participation in the four commodities of horticulture, livestock, maize and other field crops. The hypotheses developed in the theoretical concept are that the presence of fixed transaction costs will inhibit decisions to participate, while the variable costs will influence the level of participation. For empirical analysis, the three constructs of information, assets and household structure will be included in the set of models. To reflect the existence of fixed transaction costs, these constructs will be included in the models determining the decision to participate in the market – thereby testing the hypothesis of fixed transaction costs. Similarly, to reflect the existence of variable transaction costs, these constructs will be included in the models of the level of participation – thereby testing the hypothesis of variable transaction costs.

Table 5.2 shows the hypothesised relationship between the explanatory variables and market participation. The first set of models identifies factors that influence a household in its decision to sell its produce, as opposed to not selling. The hypothesis is that fixed transaction cost factors will be responsible for the decision to participate in the market. Four models corresponding to four commodities are covered, for horticulture, livestock, maize and other field crops. The probit models will be used to determine the marginal effects, that is, the change in the probability of selling as a result of the unit change in the

explanatory variable. The positive sign implies that a unit increase in the explanatory variables leads to an increase in the probability of participating. On the other hand, a negative sign means that a unit increase in the explanatory variable will lead to a decrease in the probability of selling.

Table 5.2: Hypothesised relationship with market participation

Variable Description	Variable	Participation Decision	Participation Level
Household Endowment (Assets)			
• Size of arable land (ha)	ARABLE LAND	+	+
• Value of livestock (in R100)	LIVST100	+	+
• Pensions earned (R)	PENSION	-	?
• Non-farm earnings (R)	NON-FARM	+	+
• 1 if owning a tractor or vehicle	TRACVECD	+	+
Information Access			
• Farming was learned through extension visits	SKOLVIST	+	+
• Average household education (yrs	AVER-EDU	+	+
• Distance to nearest town	DISTNTNG	-	-
• Road conditions to nearest town are good	RCTNT	+	+
Household Characteristics			
• Household head is female	HHGENDA	-	-
• Age of household head (years)	HHAGE	+	+/-
• Household size in AE	AEHHSIZE	-	-
Interaction Factors			
• Interaction of proximity and road conditions to nearest town	DISTNRCT	-/+	-/+
• Interaction between education and salary/wage earnings	EDUSLRW	+	+

The next set of models answer the second question by identifying factors that influence the level of market participation for each commodity. It is conjectured that the variable transaction costs factors will influence the level of participation. Similarly, four models corresponding to the four commodities are estimated. These models are estimated using the second stage of selectivity (Heckman) model and involves inclusion of a variable to absorb selectivity bias (ECI, 1999). The model results present the partial effects of E[Y] = Xb + c*L with respect to the vector of characteristics. The effects are computed at the means of the Xs. The Xb indicates the direct effects in the regression. Means for direct effects are for selected observations. The c*L indicates the indirect effects in LAMDA or inverse mills ratio. Means for indirect effects are the full sample used for the probit. The direct effects estimates determine the change in the value of sales

resulting from the unit change in the explanatory variables for those households who sell. The total effects determine the change in the value of sales resulting from the unit change in the explanatory variable for the entire sample. The positive sign implies that the unit change in the variable leads to positive change in the value of sales.

The third set of models tends to answer the two questions by identifying the factors affecting the decision to participate and the level of participation at the same time. The Tobit models results indicate the marginal effects of a unit change in the explanatory variable. In appendix five the results are also compared with OLS results.

The LIMDEP econometric software was used to run the sets of models (ECI, 1999). The results of the selectivity models are presented per commodity. For each commodity two procedures will be discussed. First, the probit results will be presented to determine the significant factors in the decision to participate. Following the theoretical exposition and the view in the literature, those variables affecting the decision to participate are related to fixed transaction costs. Secondly, the results of OLS in the second stage (or Heckits) will be presented to determine the significant factors influencing the level of market participation. These factors are regarded as leading to variable transaction costs that constrain farmers from selling more. The results for the horticulture market are presented first, followed by the livestock market, then the maize market, and, lastly, the market for other field crops. Similar models are run following Tobit procedure, and results presented in Appendix two.

5.3 PARTICIPATION IN HORTICULTURAL MARKETS

In modelling households' participation in horticultural markets it is anticipated that the household endowment (or assets) plus access to information in terms of prices, production practices and marketing opportunities would be key factors influencing participation process. The farmers produce a variety of products ranging from banana and other fruits to different vegetables. It is assumed, however, that the different horticultural commodities might be affected in similar ways by different factors affecting the process of participation. The model was

estimated by using a two-step procedure. In the first step the probit model was estimated to identify factors affecting decision to participate. In the second step the OLS adjusted for selectivity bias (heckit) model was estimated to determine significant factors of level of participation in horticultural market.

5.3.1 Decisions to sell horticultural crops

The model of decisions to sell horticulture commodities identifies characteristics that stimulate households to sell horticultural commodities as opposed to those who do not. The model attempts to determine factors associated with the fixed transaction costs in horticulture markets. The model is specified as:

Pr(HORTMKT) = f(ARABLE LAND, LIVST100, PENSION, NFARM100, SKOLVIST, AVER-EDU, RCTNT, DISTING, HHGENDA, HHAGE, AEHHSIZE, DISTNRCT, EDUNFARM).

That is the probability of selling horticultural crops depends on the set of explanatory factors, equivalent to the fixed transaction costs.

Table 5.3 presents the results of the probit estimations of factors significantly influencing the decision to sell horticultural commodities. The model correctly predicted 87% of the observations, with significance chi-squared of 63.98. Six of the fourteen variables had coefficients that were significantly different from zero.

Three of the variables were positively associated with the probability of selling horticultural commodities. The age of the head of the household, the size of the arable land, and obtaining information through extension contacts increased the chance of household selling horticultural commodities. The other three significant factors were negatively associated with the probability of selling horticultural commodities. The value of livestock owned, the amount of pension received, and the household size tended to decrease the likelihood of selling horticultural crops. With the exception of the value of livestock and pensions, all the significant variables had the expected signs.

The results imply that getting information through extension contacts has a considerable marginal effect on increasing the probability of selling horticultural crops. This result calls for a very responsive extension service assisting in the

areas where farmers engage in horticulture. Being perishable crops, horticulture crops should be sold at once, and this requires information on the spot. The extension service should assist by providing up-to-date information about markets and how to deal with the marketing process. This has major implications for the way extension officers are trained in South Africa at present. For optimal assistance they should be well equipped with technical knowledge but also should also understand process of marketing, as well as be aware of current market opportunities and prices at different locations.

Table 5.3: Factors of decision to sell horticultural commodities: probit results

Factor	Coefficient	Marginal
Constant	-4.2682** (1.7452)	-0.6299** (0.2761)
Household Endowment (Assets)		
• Size of arable land (ha)	0.3131*** (0.0723)	0.0462*** (0.0146)
• Value of livestock (in R100)	-0.0046 (0.0029)	-0.0007* (0.0004)
• Pensions earned (R)	-0.0001* (0.0001)	-0.0000* (0.0000)
• Non-farm earnings (R)	-0.0002 (0.0034)	-0.0000 (0.0005)
• Owning a tractor or vehicle	0.3076 (0.5356)	0.0454 (0.0796)
Access to Information		
• Farming was learned through extension visits	1.0492** (0.5044)	0.1549** (0.0728)
• Average hh education (yrs)	0.0535 (0.1056)	0.0079 (0.0156)
• Distance to nearest town	0.0154 (0.0221)	0.0023 (0.0034)
• Road conditions to nearest town are good	0.4903 (0.1914)	0.0724 (0.1337)
Household Characteristics		
• Household head is female	-0.5992 (0.5353)	-0.0884 (0.0743)
• Age of household head (years)	0.0448* (0.0242)	0.0066* (0.0039)
• Household size AE	-0.1836** (0.0883)	-0.0271** (0.1383)
Interaction Factors		
• Interaction of proximity and road conditions to nearest town	-0.0225 (0.0326)	-0.0033 (0.0049)
• Interaction between education and non-farm earnings	-0.0002 (0.0003)	-0.0000 (0.4807)
% Correctly predicted Model CHI-SQ N = 138	87 63.98***	
N Selling = 27		

* = 10% sign level, ** = 5% sign level, *** = 1% sign level (Std errors in brackets)

The next important factor in market participation is access to arable land. This variable has a higher marginal effect, meaning that more access to arable land might increase the chance of selling horticultural crops significantly. Typically, access to more arable land will encourage farmers to grow more horticultural crops, which leads to surplus production requiring marketing. The age of the head of the household is also important in the decision to sell horticultural crops. This has probably to do with experience since horticultural crops are very specialised commodities.

The results indicate that the marginal effect of household size on the likelihood of selling horticulture is the more important one among the negative factors. That is, every additional member in the household will decrease the probability of selling horticultural crops. Ownership of additional livestock also decreases the probability of selling. The reason for this is that owning livestock implies that households will devote more time to livestock production rather than spending it on selling horticultural crops. Earning pensions also decreases the likelihood of selling crops. Pension earners probably decide to invest pensions in other consumption items rather than in activities related to the selling of horticultural produce.

Other factors were not significant. Those that were positive included average education, ownership of tractor or vehicle, vicinity to the nearest town, and access to roads in good condition, thus confirming the hypotheses. The negative effects were ascribed to non-farm income, being female farmer, and the interaction between distance and road conditions, and between average education and non-farm income.

The results provide some ideas about the role of fixed transaction costs in horticultural markets. Access to information through extension and ownership of endowment such as land tends to remove the fixed transaction costs facing the smallholder farmers in entering the horticultural markets. Being older also assists farmers to overcome the fixed transaction costs since over time some experience about the market has been built up. Other asset endowments such as livestock and pensions do not help to overcome transaction costs in horticultural markets.

The reason for the latter might be farmers drawing pensions might be too old to follow new market trends.

5.3.2 The level of horticultural sales

The model seeks to identify factors that influence the level of horticultural sales. The model is specified as

HORTVALU = f(ARABLE LAND, LIVST100, PENSION, NFARM100, SKOLVIST, AVER-EDU, RCTNT, DISTING, HHGENDA, HHAGE, AEHHSIZE, DISTNRCT, EDUNFARM, LAMDA)

This means that the value of horticultural crops sales depends on the set of factors indicated. The second stage of the selectivity model (heckit or OLS accounting for bias) is estimated to determine factors influencing the level of horticultural sales.

Table 5.4 presents the results of the determinants regarding the level of horticultural sales. The R-square and adjusted R-square are respectively, 44 and 38%, with the overall significant fit of 6.49. The inverse mills ratio (lambda) for the level of horticulture sales was significant, implying that a sample selection would have resulted if the level of sales in horticulture had been estimated without taking into account the decision to participate in the horticultural market.

Eight of the fourteen variables had coefficients significantly different from zero. Two were only significant in the direct effect (but not in the total effect) meaning that the factors were important only among those who were selling horticultural crops. On the other hand, only one variable was significant in the total effect (but not in the direct effect) implying that the variable was quite important among all households.

Three of the significant variables were positively associated with the level of horticultural sales. The results suggest that an increase in arable land by a hectare leads to an increase of about R1052 in horticulture sales for those who are already selling produce. These results are in line with the tobit results (in the Appendix A-2.1) with marginal effects of about R209 hectare increase. The

results might provide a motivation to speed up the provision of more arable land to horticultural farmers. Further, the decrease of distance from the household to the nearest town by a kilometre causes the value of horticulture crops sold to increase by R152 and R104. The former is the increase for those farmers already selling, and the latter result is the increase for all farmers. As such, the location of farmers in respect of potential markets is an important factor in encouraging farmers to increase their sales. For example, banana farmers in Homo are able to market much of their banana crop since they are relatively close to the town of Giyani, where a range of marketing facilities are available and accessible.

Table 5.4: Factors influencing the level of horticultural crop sales: heckit results#

	Direct	Indirect	Total
Constant	5538.6 (4289.1)	13333 (326.04)	
Household Endowment			
• Size of arable land (ha)	1054.2*** (152.12)	-977.99 (23.908)	76.169 (153.99)
• Value of livestock (in R100)	-8.8769* (4.6145)	14.303 (0.3501)	5.4256 (4.6277)
• Pensions earned (R)	-0.2195 (0.1846)	0.3412 (0.0083)	0.1217 (0.1848)
• Non-farm earnings (R)	24.690** (10.736)	0.6526 (0.0162)	25.343** (10.736)
• 1 if owning a tractor or vehicle	-1046.3 (1589.3)	-961.11 (23.470)	-2007.4 (1589.4)
Access to Information			
• Farming was learned through extension visits	1201.7 (1250.9)	-3277.9 (80.211)	-2076.2 (1253.5)
• Average hh education (yrs)	188.34 (296.44)	-167.27 (4.0923)	21.069 (296.47)
• Distance to nearest town	152.21*** (57.045)	-47.963 (1.1715)	104.25* (57.057)
• Road conditions to nearest town are good	-4926.5* (2670.6)	-1531.6 (37.508)	-6458.1** (2670.9)
Household Characteristics			
• Household head is female	-1209.1 (1277.1)	1871.9 (45.872)	662.85 (1277.9)
• Age of household head (years)	-19.655 (64.391)	-140.07 (3.4235)	-159.72** (64.482)
• Household size AE	-479.76* (291.11)	573.63 (14.028)	93.874 (291.45)
Interaction Factors			
• Interaction of proximity and road conditions to nearest town	-121.16 (98.029)	70.162 (1.7130)	-50.999 (98.045)
• Interaction between education and salary/wage earnings	-2.1042** (0.9954)	0.4963 (0.0121)	-1.6079* (0.9955)
LAMBDA	3707.0 (879.21)		
R-SQ	0.44		
ADJ R-RQ	0.38		
F-TEST	6.49***		
N	27		138

* = 10% sign level, ** = 5% sign level, *** = 1% sign level(Std errors in brackets)
# Heckit regression is equivalent to the second stage of Heckman's procedure

The results also suggest that an increase in non-farm income by R100 leads to an increase in horticultural sales by R25. Most of the horticultural farmers have other businesses, which are used to sell the horticultural products. One of the relatively large farmers in the Lowveld indicated that she sells most of her

vegetables in her restaurant. She also said that she uses some of her proceeds from her other business to transport vegetables to the market. Many horticultural producers use non-farm income to facilitate the selling of the products. It should be noted that this result is unrelated to the effect of non-farm income to the decision to sell. This implies that when households have access to non-farm income, they may not necessarily decide to participate in horticultural markets since non-farm income can function as a substitute for selling. However, when the farmers are already selling horticultural crops, then non-farm income can help them to sell more.

Five of the significant variables were negatively affecting the level of horticulture sales. It was surprising that access to good roads negatively affected the level of participation. This was the case at a significance level of 5 to 10%. This may imply that in trying to manage the problem of infrastructure, households facing inaccessible roads would take more to the market to avoid extra trips. The more plausible explanation, however, may be that, compared to other farmers in horticulture, the group of banana farmers at Homo are selling relatively more per trip, notwithstanding the bad condition of the roads to Giyani in order to reduce transport costs.

The results further suggest that every additional member of the participating households was associated with a decrease in horticulture sales by R497. The tobit results (in Appendix A-2.1) show a marginal decrease of R141 in sales. This shows that typical sample households with many members tend to consume more than they contribute to the sales of the horticultural crops. In other words, households with many members may not sell since they have more mouths to feed. An increase in the age of the head of the household by one year leads to a reduction in value of horticulture sales by R159 in the entire sample. The implication of this effect is different from the decision to sell, implying that older heads of households might have the knowledge where to market their crops since they have been involved for a longer time, but may lack the ability to sell more. In fact, younger farmers may be more willing to take the risk of taking more products to the market, with the attendant risk of not selling at all, than the older farmers would. Also, most of the younger farmers are involved in high value crops such as bananas on good farms, while most of the elderly farmers

are found on vegetable operations. As a result, even if the elderly are more willing to sell their horticultural crops, they will not sell as much as the younger farmers.

An increase in the value of livestock by R100 results in a decrease in horticulture sales by about nine Rands. As indicated earlier, the more livestock the households have the less time they have to devote to horticultural activities. Livestock ownership and horticultural selling are both labour demanding. Those farmers who own livestock will have to herd the livestock's movements between the grazing camp and the kraal. Hence such farmers rarely get heavily involved in horticultural activities. Being educated and earning a non-farm income did not necessarily increase the level of horticulture sales. This result is not as expected. The possible explanation could be that being educated and earning non-farm income makes households more secure with livelihoods so that they don't need to be involved in horticultural activities. In addition, by being involved in other income earning activities households may not have sufficient time to be involved in horticultural marketing as well.

The tobit results provide further insight into the factors influencing the level of horticultural sales. The effects generally showed the same direction as the heckit results. As indicated earlier, access to arable land, livestock ownership, non-farm income and the size of household were also significant. The tobit estimates were generally biased downward compared to the heckits. Three variables were significant in the tobit results, but not in the heckits. The tobit results showed that being female farmer reduced the level of horticultural sales by R1024 as compared to being male farmer. The results further showed that contact with extension service tends to increase the level of horticultural sales. That is, those farmers with contact could sell R726 worth of horticultural products. These results are in line with the probit findings that had to do with the decision to participate. Finally, earning pensions tended to reduce the level of horticultural sales, similar to the probit findings showing the negative effect of access to pensions.

The results indicate that the level of sales in horticulture would be increased if the variable transaction costs were overcome by providing enough land (with water

for irrigation). The variable transaction costs will be reduced if the markets would be located closer to the farmers. This proximity might complement the role of non-farm income in reducing the transaction costs to the market. The result gives the impression that good road conditions and better education lead to higher transaction costs. This is in contrast with the initial expected outcomes. The explanation for this could be that because of a legacy of neglecting horticulture as a means of income, households which are in a position to access amenities such as education and better road conditions prefer to use them for other activities rather than to extend their horticultural activities. On the other hand farmers involved in horticultural marketing will remain to be a neglected group if no education and/or training is provided and if no infrastructure support is given. If these issues were to be addressed they would certainly alleviate the negative transaction costs effect on participating in the market. The results further indicate that age is associated with high and variable transaction costs. This implies that younger farmers will experience lover variable costs. Hence it is pertinent that particularly the younger farmers are encouraged to be involved in horticulture.

The value of livestock seems to increase the variable transaction costs in horticulture. As indicated earlier, livestock ownership and horticultural marketing are substitutes for each other. Since they are both high value activities, the household focuses either on horticulture or on livestock. In the next section we present the results of the livestock market participation model.

5.4 PARTICIPATION IN THE LIVESTOCK MARKET

The households' participation process in livestock markets is considered to be influenced by the household endowment (or assets) plus access to information in terms of prices and marketing opportunities in relation to transaction costs. Livestock farmers keep a variety of livestock types such as cattle, goats, sheep, pigs, poultry etc. It is assumed that the different livestock products might be

affected by different factors, but affecting the process of participation in similar ways. The livestock market participation model was estimated by following a similar two-step procedure as for horticulture. In the first step the probit model was estimated to identify the (fixed transaction costs) factors affecting the decision to participate in the market. In the second step the OLS adjusted for selectivity bias, the (heckit) model was estimated to determine the significant (variable transaction costs) factors of the level of participation in the horticultural market. These results are also contrasted with the tobit results in the appendix A-2.1.

5.4.1 Decision to sell livestock

The model for decision making to sell livestock determined characteristics that differentiated livestock sellers from those who do not. The model is specified as:

Pr(LIVSTMKT) = f(ARABLE LAND, LIVST100, PENSION, NFARM100, SKOLVIST, AVER-EDU, RCTNT, DISTING, HHGENDA, HHAGE, AEHHSIZE, DISTNRCT, EDUNFARM)

This means that the probability of selling livestock depends on the set of fixed transaction costs factors as indicated.

The results are presented in Table 5.5. The model correctly predicted 86% of the observations, with the significant Chi-square of 63.98. Five of the 14 variables were significant.

Table 5.5: Factors influencing the decision to sell livestock: probit results

Factors	Coefficient	Marginal Effects
Constant	-1.0749 (1.2773)	-0.2034 (0.2425)
Household Assets		
• Size of arable land (ha)	-0.0195 (0.0402)	-0.0037 (0.0076)
• Value of livestock (in R100)	0.0079*** (0.0020)	0.0015*** (0.0005)
• Pensions earned (R)	-0.0001** (0.0001)	-0.0000** (0.0000)
• Non-farm earnings (R)	0.0008 (0.0039)	0.0002 (0.0007)
• Owning a tractor or vehicle	-0.2916 (0.5165)	-0.0552 (0.0963)
Information Access		
• Farming was learned through extension visits	-0.0305 (0.3468)	-0.0058 (0.0656)
• Average hh education (yrs)	0.0530 (0.0885)	0.0100 (0.0168)
• Distance to nearest town	0.0369** (0.0168)	0.0070** (0.0033)
• Road conditions to nearest town are good	-0.1724 (0.9130)	-0.0326 (0.1739)
Household Characteristics		
• Household head is female	0.9381*** (0.3565)	0.1775** (0.0703)
• Age of household head (years)	0.0290 (0.0210)	0.0055 (0.0040)
• Household size AE	-0.2139* (0.1105)	-0.0405** (0.0201)
Interaction Factors		
• Interaction of proximity and road conditions to nearest town	0.0195 (0.0391)	0.0037 (0.0072)
• Interaction between education and salary/wage earnings	-0.0001 (0.0004)	-0.0000 (0.0001)
% Correctly predicted CHI-SQ F-TEST	86 47.64***	
N = 138		
N selling = 26		

* = 10% sign level, ** = 5% sign level, *** = 1% sign level (Std errors in brackets)

The value of livestock owned, the gender of the head of the household and the distance (proximity) to the nearest town were positively and significantly associated with the probability of selling livestock. When a female heads the household, this tends to increase the chance of selling livestock by greater margins than other factors did. This implies that women are more inclined to sell their livestock than men are. These results, that is, that women are more likely to sell their livestock than men, are in contrast with the expected outcomes.

Possibly two feasible explanations are that, firstly, women tend to own smaller stock, such as goats and chickens that are relatively easy to sell, and, secondly, women do not keep livestock as a social status symbol, but merely to earn a livelihood.

The distance to the nearest town has the second highest marginal effect on increasing the probability of selling livestock. As expected, the results suggest that those households located closer to the nearest town are more likely to sell their livestock in comparison to those living further away. This contention is plausible since farmers in the vicinity of towns have a much easier access to up-to-date information about the markets, for the simple reason that regional extension offices and some marketing institutions are located in these towns.

The value of livestock owned has the third highest marginal effect on the probability of selling livestock. In fact, this result corrects the common perception that smallholder farmers prefer to cling to their livestock as a store of wealth, meaning that farmers are generally not willing to sell their livestock even when they own much. According to the results, the unit increase in the value of livestock leads to an increase in the chance of selling. It follows that policies and programmes promoting ownership of livestock will automatically improve the opportunities for the household to earn a livelihood. The other factors positively affecting the decision to sell livestock are not significant. They include access to non-farm income, the age of the head of the household, average education, and being closer to town with access to good roads. The non-significance of non-farm income, average education and being closer to town are not very puzzling. Normally, livestock marketing does not require liquid assets since livestock units may be walked to auctions. Further, the fact that livestock can be sold as individual divisible units at any time makes marketing less stringent with respect to the requirement of liquid assets. Similarly, market conditions of livestock are generally very standard, in the sense that they don't need general education to understand the information pertaining to the market. Specialised education and training about livestock market conditions could, however, be useful.

The condition of the road also does not matter for livestock sales. This is particularly the case when farmers are located close to town. In fact, livestock

(particularly cattle) are walked better on gravel roads than on tar. The fact that the age of the head of the household is not significant is unexpected. One would have expected this factor to have some impact, such as younger farmers being more willing to sell their livestock since they still need more income to pay for other needs. However, the positive sign might imply that younger livestock farmers prefer to accumulate livestock rather than sell it. Similarly, older farmers may be willing to dispose off some of their livestock to meet other cash requirements since they might not have other sources of income.

Two factors were significant and negatively associated with the probability of selling livestock. The household size had a rather high negative marginal effect on the chance of selling livestock. That is, every additional member to the household tended to decrease the chance of the household selling livestock. The reason for this might have been that livestock selling involves negotiations within the household. So, the more members are there to be consulted, the less likely that decision to sell will be positive. Also, the decision to sell may be affected by considerations to inherit livestock. Typically, children inherit the livestock from their parents, so for each additional member in the household the need for inheritance might add up negatively to come to the decision to sell. The other negative significant factor is the earning of pensions. The results suggest that those who earn pensions have lower chances of selling their livestock. In actual fact, looking at the group of elderly farmers, the acquisition of pensions is dividing in this group: elderly farmers not earning pensions are more likely to sell livestock (although not with the same probability as the younger farmers). On the other hand, elderly farmers earning pensions are less likely to sell livestock since they have a better chance to meet cash requirements with their pension money.

Other factors were not significantly affecting the probability of selling livestock negatively. They included the size of arable land, the ownership of tractor or vehicle, road conditions, contacts with extension officers, and having received education and earning a non-farm income. These results are not strange. Arable land is used for crop production, which, as mentioned above, may be a substitute for livestock. However, the insignificant results are related to the offsetting fact that some of the arable land is used for grazing during the fallow season. Ownership of a tractor or vehicle normally prompts households to be involved in

other activities than livestock selling. The negative sign of contact with the extension office illustrates the bias that extension service has with regard to livestock. Normally, extension contacts tend to emphasise crop production, and livestock marketing is not much stressed. This is caused by the fact that officers frequently assume that farmers already know about livestock marketing systems. This perception may be wrong. The results show that there are some farmers whose attitude towards livestock is negatively affected by lack of contact with extension officers, although not very significantly.

These results suggest that the important fixed transaction costs factors affecting the decision of household to sell livestock include being female (particularly when smaller divisible units are owned), proximity to the nearest town, as well as ownership of livestock *per se.* The size of the household and the receiving of pensions tend to exacerbate fixed transaction costs, which prohibit households from selling livestock.

5.4.2 The level of livestock sales

The model of livestock sales also determines the factors influencing the level of livestock sales. The model is specified as

LIVSTVAL = f(ARABLE LAND, LIVST100, PENSION, NFARM100, SKOLVIST, AVER-EDU, RCTNT, DISTING, HHGENDA, HHAGE, AEHHSIZE, DISTNRCT, EDUNFARM, LAMDA)

This means that the value of livestock sales depends on the set of variable transaction costs factors as indicated. The second stage of selectivity model (OLS accounting for bias) is estimated to determine significant factors (or variable transaction costs) influencing the level of livestock sales.

The results are presented in Table 5.6. The model R-square and adjusted R-square were 52% and 48% respectively, with a significant overall fit of 8.72. The inverse mills ratio was significant indicating that a selectivity bias would have resulted if the livestock sales were estimated without taking into account the

decision to sell livestock. Six of the 14 variables had coefficients significantly different from zero.

Five of the significant variables were positively associated with the value of livestock sales. The results suggest that access to good road conditions might result in an increase in the value of livestock sales by about R1344. The tobit results in appendix A-2.2 suggest a marginal effect of R301. When good roads are located closer to town, however, each kilometre results in an increase of livestock sales by about R46 (and R21 from tobit regressions). These results may seem contradictory to the earlier results relating to the decision to sell. What these results imply is that the road conditions may not contribute positively towards the decision to sell livestock, but once the household has decided to sell, the road conditions can positively increase the amount of livestock sold. This would, for example, happen when more livestock is transported to the market.

An increase in the size of arable land by a hectare might lead to an increase of about R1324 in livestock sales. Although the results of the decision to sell livestock was not significantly affected by arable land, this negative effect mentioned earlier creates a contradiction with these findings. Similar to the earlier explanation, it appears that factors influencing the decision to sell are different from the level of selling. Hence the tobit results are not significant in this regard. The results indicate that when livestock farmers have arable land they are able to increase their livestock sales for two possible reasons. Firstly, ownership of arable land may provide security for livestock farmers to sell livestock. Secondly, it is common practice to graze livestock on arable land lying fallow, and this would also encourage more livestock sales. As expected, an increase by R100 in the value of livestock owned leads to an increase of about R8.53 in livestock sales. Again, these results are encouraging when the fact is considered that promoting ownership of livestock will result in more livestock sales, which in turn will improve livelihoods.

Table 5.6: Factors influencing level of livestock sales: heckit results

Variable Description	Direct	Indirect	Total
Constant	-585.29 (1103.2)	749.03 (17.360)	
Household Assets			
• Size of arable land (ha)	1323.81*** (38.976)	13.609 (0.3174)	137.42*** (38.977)
• Value of livestock (in R100)	8.5362*** (1.1890)	-5.5046 (0.1272)	3.0316** (1.1958)
• Pensions earned (R)	-0.4748 (0.4751)	0.1003 (0.0023)	0.0528 (0.0476)
• Non-farm earnings (R)	2.3699 (2.7776)	-0.5551 (0.1318)	1.8148 (2.7776)
• Owning a tractor or vehicle	351.45 (406.03)	203.16 (4.759)	554.61 (406.05)
Access to information			
• Farming was learned through extension visits	-329.69 (319.86)	21.224 (0.5854)	-308.46 (319.86)
• Average hh education (yrs)	61.386 (76.269)	-36.926 (0.8605)	24.4597 (76.274)
• Distance to nearest town	10.113 (14.734)	-25.722 (0.5962)	-15.609 (14.746)
• Road conditions to nearest town are good	1343.7** (685.30)	120.12 (2.7997)	1463.8** (685.31)
Household Characteristics			
• Household head is female	852.82*** (326.78)	-653.67 (15.145)	199.15 (327.13)
• Age of household head (years)	11.966 (16.578)	-20.232 (0.4697)	-8.2659 (16.5845)
• Household size AE	-120.38* (74.366)	149.05 (3.4636)	28.675 (74.447)
Interaction Factors			
• Interaction of proximity and road conditions to nearest town	46.349* (25.136)	-13.598 (0.3215)	32.752 (25.138)
• Interaction between education and salary/wage earnings	-0.3005 (0.2569)	0.8772 (0.0021)	-0.2128 (0.2569)
LAMBDA	844.71*** (214.20)		
R-SQ ADJ R-RQ F-TEST	0.52 0.48 8.72***		

* = 10% sign level, ** = 5% sign level, *** = 1% sign level (Std errors in brackets)

Interestingly, female farmers tend to sell more of their livestock. Even tobit results show significant difference in the livestock sales by female farmers. As mentioned earlier, this might mean that the motive of keeping livestock as a measure of social status is not applicable to female farmers. It seems as if these farmers are inclined to sell their livestock when conditions are favourable or force them to do so.

Other positive factors were not significant. They included earnings from non-farm income, average education, the ownership of a tractor or vehicle, as well as proximity to town. The age of the head of the household was also not significant in the heckit results, but significant in the tobit results. The results suggest that the experience of head of household tends to matter in influencing participation process in livestock markets.

There are four factors with a negative impact on the level of livestock sales. The size of household was the only significant factor among these. The results suggest that an increase in household size by one member leads to a reduction of about R120 in livestock sales. In many rural areas of South Africa, livestock keepers prefer to divide livestock as an inheritance among their children. It follows that households with a number of children prefer to keep their livestock and rather buy additional livestock than sell. Receiving pensions was not significant in the heckit results, but was significant in the tobit procedure. This suggested that those households receiving pensions had less motivation to sell their livestock. One would even suspect that some would be willing to buy more livestock. Other factors negatively (though not significantly) associated with livestock sales include contacts with the extension service, being educated, and earning non-farm income.

The results suggest that variable transaction costs associated with the selling of livestock hinge upon factors such as access to good roads, the size of arable land, livestock ownership, being a female farmer, as well as proximity to town by means of good roads. The size of the household tends to exacerbate the occurrence of variable transaction costs.

5.5 PARTICIPATION IN THE MAIZE MARKET

Unlike horticulture and livestock that are high value commodities, households tend to produce and dispose of maize in a variety of ways. Most of the maize produced is consumed within the household. Some maize is exchanged for processed grain, while the rest is sold for cash. The focus in this section is on

identifying the potential for maize to generate income for smallholder farmers. The view is that fixed and variable transaction costs factors would explain the process of market participation in maize. The maize market participation model was also estimated by following the two step procedure of, firstly, identifying (fixed transaction costs) factors affecting decision to participate, and, secondly, determining significant (variable transaction costs) factors of the level of participation in the maize market.

5.5.1 Decision to sell maize

The model of decision making to sell maize identifies factors distinguishing maize sellers from those who do not. The model is specified as:

Pr(MAIZMKT) = f(ARABLE LAND, LIVST100, PENSION, NFARM100, SKOLVIST, AVER-EDU, RCTNT, DISTING, HHGENDA, HHAGE, AEHHSIZE, DISTNRCT, EDUNFARM)

This means that the probability of selling maize depends on the set of fixed transaction costs factors as indicated. The results of the model are presented in Table 5.7. The model correctly predicted 82% of the observations, with a significant chi-square of 29.61.

Only two of the 14 variables had coefficients significantly different from zero. The size of arable land was positively associated with the probability of selling maize. This could be associated with the fact that a larger area of arable land provides a greater opportunity for surplus production. Generally households decide to sell, when they cannot consume all they have produced. That is, a decision to sell is preceded by a decision to consume. This is in line with the fact that an increase in household size significantly decreases the possibilities for selling maize. The more members the household has, the more likely that most of the produce will be consumed. It follows that the level of sales will mainly depend on the offsetting effects between arable land and household size. As it is, the household size has a greater negative marginal effect than the positive marginal effect of arable land.

Table 5.7: Factors influencing decision to sell maize: probit results

Variable Description	Coefficient	Marginal Effects
Constant	-0.1978 (1.1338)	-0.0505 (0.2900)
Household Endowment		
• Size of arable land (ha)	0.0815** (0.0347)	0.0208** (0.0091)
• Value of livestock (in R100)	0.0007 (0.0011)	0.0002 (0.0003)
• Pensions earned (R)	-0.0000 (0.0005)	-0.0000 (0.0000)
• Non-farm earnings (R)	-0.0038 (0.0034)	-0.0010 (0.0009)
• Owning a tractor or vehicle	0.3546 (0.3876)	0.9064 (0.0995)
Access to Information		
• Farming was learned through extension visits	0.0204 (0.3118)	0.0052 (0.0797)
• Average household education (yrs)	-0.0312 (0.0759)	-0.0080 (0.0194)
• Distance to nearest town	0.0044 (0.0159)	0.0011 (0.0041)
• Road conditions to nearest town are good	0.5028 (0.6936)	0.1285 (0.1776)
Household Characteristics		
• Household head is female	-0.0836 (0.3429)	-0.0214 (0.8770)
• Age of household head (years)	0.0073 (0.0158)	0.0019 (0.0041)
• Household size AE	-0.2595*** (0.0922)	-0.0663*** (0.0224)
Interaction Factors		
• Interaction of proximity and road conditions to nearest town	0.0019 (0.0253)	0.0049 (0.0065)
• Interaction between education and salary/wage earnings	0.0004 (0.0003)	0.0010 (0.0008)
% Correctly predicted CHI-SQ	82 29.61***	
N = 138		
N Selling = 30		

* = 10% sign level, ** = 5% sign level, *** = 1% sign level (Std errors in brackets)

Other variables (although insignificant) that increased the possibilities of selling maize were the value of livestock, the age of the head of the household, and the ownership of a tractor or vehicle. The proximity to town, the road conditions, contacts with extension services, being close to town with accessible roads as well as being educated and earning anon-farm income were also positively associated with the probability of selling maize. The insignificant and negatively associated variables included pensions, non-farm income, the gender of the head of the household, and average education.

This model does not provide a clear indication of the role of fixed transaction cost factors. As indicated, the fact that maize is a consumption (or food security) commodity makes identification of pertinent factors a little difficult. As it is, an increase in the likelihood of selling maize, which is related to a decrease in fixed transaction costs, merely requires the provision of land in order to offset the consumption requirement by the members of household. This model does not seem to give a satisfactory explanation of the factors influencing the decision to sell maize. Perhaps, it could be useful to incorporate other decisions of consuming and exchange in a different model, which was beyond the scope of this study.

5.5.2 The level of maize sales

The model identifies factors influencing households to sell more maize. The model is specified as:

MAIZVAL = f(ARABLE LAND, LIVST100, PENSION, NFARM100, SKOLVIST, AVER-EDU, RCTNT, DISTING, HHGENDA, HHAGE, AEHHSIZE, DISTNRCT, EDUNFARM, LAMDA)

This means that the value of maize sales depends on the set of variable transaction costs factors as indicated. The second stage of the selectivity model (OLS accounting for selectivity bias) is estimated to determine significant factors influencing the level of maize sales.

The results are shown in Table 5.8. The model R-Square and adjusted R-square are respectively, 54 and 48% with a significant overall fit. The inverse mills ratio has a coefficient significantly different from zero. This indicates that the selectivity bias would have resulted had the maize sales been estimated without consideration of the decision to sell maize. Only three variables had coefficients significantly different from zero. The tobit results (in Appendix A-2.3) also showed the same pattern with marginal effect coefficients biased downward compared to the heckit results.

The results suggest that an increase in the arable land by a hectare will lead to an increase in maize sales by R52 among those households who have elected to sell maize. However, the sales in this same group will decrease by about R77 for every additional household member in the participating household. When the entire sample is considered an increase in household size by one additional member would lead to a total increase in maize sales by about R71. This implies that the indirect effect (of non-selling households) tends to offset the negative effect of household size. The results also suggest that an increase in the value of livestock owned by R100 leads to an increase in maize sale by about R1.56.

The positive non-significant variables included pension earnings, average education, ownership of a tractor or vehicle, the direct effect of proximity to town, conditions of the road, contacts with extension officers, and two interaction factors of education and non-farm income. The non-farm income, the gender and age of the head of the household, the combined effect of proximity to town and road conditions, as well as the interaction between education and non-farm income were negative but not significant in terms of influencing the level of the maize sales.

Like the model describing the decision to sell maize, this model determining factors affecting the level of maize sales does not provide a good explanation of the existence of variable transaction costs factors. As it is, the model predicts that only assets such as arable land and livestock owned would ameliorate the variable transaction costs related to maize selling.

Table 5.8: Factors of the level of maize sales: heckit results

Factors	Direct	Indirect	Total
Constant	594.79 (504.77)	112.59 (2.6245)	
Household Endowment			
• Size of arable land (ha)	51.513*** (18.982)	-46.395 (1.0228)	5.1183 (19.009)
• Value of livestock (in R100)	1.5625*** (0.5703)	-0.3859 (0.0086)	1.1766** (0.5704)
• Pensions earned (R)	0.0146 (0.0218)	0.0038 (0.0001)	0.0184 (0.0218)
• Non-farm earnings (R)	-1.0794 (1.2665)	2.1791 (0.0482)	1.0997 (1.2675)
• Owning a tractor or vehicle	216.97 (188.23)	-201.99 (4.4715)	14.982 (188.29)
Access to Information			
• Farming was learned through extension visits	147.01 (148.79)	-11.622 (0.3573)	135.39 (148.79)
• Average household education (yrs)	9.6355 (35.049)	17.775 (0.3972)	27.411 (35.051)
• Distance to nearest town	2.2424 (6.6985)	-2.5056 (0.0569)	-0.2632 (6.6987)
• Road conditions to nearest town are good	167.94 (313.39)	-286.40 (6.3443)	-118.46 (313.45)
Household Characteristics			
• Household head is female	-152.20 (151.76)	47.619 (1.0912)	-104.58 (151.76)
• Age of household head (years)	-6.349 (7.6545)	-4.1295 (0.0919)	-10.478 (7.6551)
• Household size AE	-76.947** (34.465)	147.82 (3.2768)	70.869** (34.620)
Information Factors			
• Interaction of proximity and road conditions to nearest town	4.2296 (11.438)	-1.0835 (0.0303)	3.1461 (11.438)
• Interaction between education and salary/wage earnings	0.1027 (0.1171)	-0.219 (0.0048)	-0.1163 (0.1172)
LAMBDA	717.23*** (56.426)		
R-SQ	0.54		
ADJ R-RQ	0.48		
F-TEST	9.54***		
N	30		138

* = 10% sign level, ** = 5% sign level, *** = 1% sign level (Std errors in brackets)

Because both of these factors are based on access to land, it does make the findings relevant to the situation in South Africa where small-scale farmers have limited access to land. The impression is that for other factors to become significant in maize selling, the land issue needs to be addressed first. At present the land available for maize production doesn't even meet the average household requirements.

5.6 PARTICIPATION IN THE MARKET FOR OTHER FIELD CROPS

In modelling households' behaviour in selling other field crops it is expected that the transaction costs influencing that process will depend on household endowments, information and household characteristics. Apart from maize, farmers produce a variety of other field crops such as wheat, beans, grain sorghum, watermelon, etc. Although these crops have different production patterns, it is assumed that the different horticultural commodities are affected similarly by different factors affecting the process of market participation. The model was also estimated by using the two-step procedure. In the first step the probit model was used to identify factors affecting the decision to participate. In the second step the OLS adjusted for selectivity bias (heckit), model was applied in order to determine significant factors affecting the level of market participation for other field crops.

5.6.1 Decision to sell other field crops

The model describing factors influencing the decision to sell other field crops distinguished factors stimulating households to sell other field crops from those who do not. The model is specified as:

Pr(FCRPMKT) = f(ARABLE LAND, LIVST100, PENSION, NFARM100, SKOLVIST, AVER-EDU, RCTNT, DISTING, HHGENDA, HHAGE, AEHHSIZE, DISTNRCT, EDUNFARM)

This means that the probability of selling other field crops depends on the set of factors indicated. The results are presented in Table 5.9. The model correctly predicted 84% of the observations, with a significant chi-square of 49.35. Six variables had coefficients significantly different from zero.

Road conditions, the size of arable land and household size were positively associated with the probability of selling other field crops. The road conditions tend to have the largest marginal effect on the probability of selling other field crops. Most field crops are bulky and any transportation system, therefore, would require good road conditions. The household size has second highest marginal effect on the probability of selling other field crops. The reason for this is not

clear, but it may be that other field crops are normally sold to meet individual members' requirements. For example, the selling of beans to a local store is used to purchase members' clothes or special shoes. It follows that the more members there are in the household, the more necessary it is to decide to sell other field crops. The size of arable land also has a positive marginal effect on the probability of selling other field crops. That is, when large households have a reasonable area of arable land and are located relatively close to town, they are likely to decide to sell other field crops.

Table 5.9: Factors of decision to sell other field crops: probit results

Variable Description	Coefficient	Marginal
Constant	-4.4368***	-0.9398***
	(1.3507)	(0.2631)
Household Assets		
• Size of arable land (ha)	0.0951**	0.0201**
	(0.0433)	(0.0089)
• Value of livestock (in R100)	0.0040	0.0001
	(0.0011)	(0.0002)
• Pensions earned (R)	0.0001	0.0000
	(0.0001)	(0.0000)
• Non-farm earnings (R)	-0.0091**	-0.0019**
	(0.0043)	(0.0009)
• Owning a tractor or vehicle	-0.7886*	-0.1671*
	(0.4746)	(0.0983)
Access to Information		
• Farming was learned through extension visits	0.1987	0.0421
	(0.3583)	(0.0756)
• Average hh education (yrs)	0.0506	0.0107
	(0.0852)	(0.0183)
• Distance to nearest town	-0.0581***	-0.1230***
	(0.0222)	(0.1337)
• Road conditions to nearest town are good	2.3615**	0.5002***
	(0.9224)	(0.1745)
Household Characteristics		
• Household head is female	-0.1423	-0.0302
	(0.3685)	(0.0779)
• Age of household head (years)	0.0021	0.0004
	(0.0168)	(0.0036)
• Household size AE	0.1461*	0.0309*
	(0.0792)	(0.0163)
Interaction Factors		
• Interaction of proximity and road conditions to nearest town	0.0153	0.0032
	(0.0288)	(0.0059)
• Interaction between education and salary/wage earnings	0.0006	0.0001
	(0.0004)	(0.0001)
% Correctly predicted	84	
CHI-SQ	49.35***	
N = 138		
N selling = 32		

* = 10% sign level, ** = 5% sign level, *** = 1% sign level (Std errors in brackets)

The other three significant variables are negatively associated with the probability of selling other field crops. Ownership of a tractor or vehicle has a high marginal effect on decreasing the chance of selling other field crops. That is, households owning a tractor or vehicle tend to use them in other activities rather than for selling other field crops.

The distance to the nearest town has a negative marginal effect on the chance of selling other field crops. That is, the further away from town, the more likely the household will sell other field crops. The explanation for this might be that households located further away from town face restricted markets for high value crops. The selling of other field crops, which does not depend on markets in town, becomes an alternative for generating farm income. Also the earning of non-farm income has a negative marginal effect on the probability of selling other field crops.

The value of livestock, pensions, age of the head of the household, average education, contacts with extension services, and the interaction between education and non-farm income were positive but not significantly associated with the probability of selling other field crops. The factor pertaining to the gender of the head of the household r was negative but not significant.

5.6.2 The level of other field crops sales

The model identifies factors influencing the sales of other field crops. The model is specified as:

FCRPVAL = f(ARABLE LAND, LIVST100, PENSION, NFARM100, SKOLVIST, AVER-EDU, RCTNT, DISTING, HHGENDA, HHAGE, AEHHSIZE, DISTNRCT, EDUNFARM, LAMDA)

This means that the sales value of other field crops depends on the set of variable transaction costs factors as indicated. The second stage of the selectivity model (OLS accounting for bias) is used to determine significant factors influencing the level of maize sales. The results are in Table 5.10. The R-square and adjusted R-square were 55% and 50% respectively, with a

significant overall fit. The inverse mills ratio is significant: three variables have three significant direct effects, while five have a significant total effect.

Table 5.10: Factors of sales value for other field crops: heckit results

Variable Description	Direct	Indirect	Total
Constant	-273.52 (735.67)	3655.2 (89.614)	
Household Endowment			
• Size of arable land (ha)	28.399 (25.616)	-78.324 (1.9203)	-49.924* (25.688)
• Value of livestock (in R100)	-0.3111 (0.8399)	-0.3312 (0.0082)	-0.6423 (0.8400)
• Pensions earned (R)	-0.0086 (0.0314)	-0.0066 (0.0002)	-0.0153 (0.0314)
• Non-farm earnings (R)	-5.3944*** (1.8234)	7.4993 (0.1839)	2.1049 (1.8326)
• Owning a tractor or vehicle	-443.84* (273.74)	649.71 (15.938)	205.87 (274.20)
Access to Information			
• Farming was learned through extension visits	-292.53 (211.91)	-163.67 (4.0178)	-456.20** (211.95)
• Average household education (yrs)	42.714 (50.701)	-41.716 (1.0168)	0.9985 (50.711)
• Distance to nearest town	-8.2313 (9.7354)	47.855 (1.1755)	39.624*** (9.8061)
• Road conditions to nearest town are good	921.57** (454.03)	-1945.5 (47.768)	-1023.9** (456.53)
Household Characteristics			
• Household head is female	-195.20 (216.77)	117.26 (2.8842)	-77.942 (216.79)
• Age of household head (years)	4.5148 (11.102)	-1.6898 (0.0432)	2.8251 (11.102)
• Household size AE	4.1871 (51.364)	-120.33 (2.952)	-116.14** (51.449)
Interaction Factors			
• Interaction of proximity and road conditions to nearest town	-13.795 (16.673)	-12.595 (0.3141)	-26.391 (16.676)
• Interaction between education and salary/wage earnings	0.4450 (1685)	-0.4749 (0.0117)	-0.0299 (0.1689)
LAMBDA	1010.9 (90.453)		
R-SQ	0.55		
ADJ R-RQ	0.50		
F-TEST	10.06***		
N	32		138

* = 10% sign level, ** = 5% sign level, *** = 1% sign level (Std errors in brackets)

Only the favourable conditions of the road positively (and directly) increased the sales of other field crops significantly. The proximity to town was positively significant in the total effect. The results suggested that having access to good roads would increase sales of other field crops by R922 among households

participating in the market, but would decrease the sales for the entire sample. Being located closer to town by one kilometre would increase the sales by about R40 among all households. However, the location was negative (but not significant) among selected households. The tobit results, however, showed a significant negative marginal effects, which showed the influence of probit findings.

The other variables had negative significance. Non-farm income and the ownership of a tractor or vehicle decrease the sales significantly among market participants. However, the household size, area of arable land, and contacts with extension services reduces sales for the entire sample. However, the tobit results showed negative marginal effects in household size, but positive effects of arable land. These results were more similar to the findings in the decision to sell other field crops. The pattern emphasizes the fact that tobit procedure merges the two steps procedure into one. Were the two steps contradict, the tobit procedure gets aligned to the stronger effect.

5.7 SUMMARY

The results of the four models of market participation provide insights into the effect of transaction costs related to the marketing of smallholder commodities. These transaction costs affect the marketing process in two ways. Firstly, the fixed transaction costs affect the decision of the households to either participate or not. Secondly, the variable transaction costs affect the level of sales of agricultural commodities. The overall results are summarized in Table 5.11. Only the signs and levels of significance are indicated.

5.7.1 Fixed transaction costs in decision to sell

The results of the four models on households' decisions whether to participate in agricultural markets provide some indications of factors responsible for fixed transaction costs, i.e. the factors inhibiting or constraining market participation. It is expected that households with more endowments would be in a much stronger position to negotiate access to markets. These households often own vehicles and tractors, which provide increased mobility enabling them to choose between various market outlets and access better information about the alternatives. The results of the different models confirm the notion that ownership of assets is an important factor influencing the decision to sell. In the case of the three crop-related farming systems, access to arable land appears to be the most crucial factor influencing the decision to sell. Throughout it was found that an increased hectarage of arable land leads to an increased likelihood for farmers to participate in the market. Arable land is, obviously, not important in the decision to sell livestock, which is mainly influenced by the ownership of livestock. On the other hand, ownership of livestock tends to discourage households from entering horticultural markets. It is not significantly influencing the decision to enter maize or other field crop markets. This pattern is as expected, since livestock and crop enterprises tend to compete for land and labour resources, although smallholders have access to both grazing land and arable land. For marketing to be successful, labour and capital resources will have to be dedicated to either, and not both, of the enterprises.

Access to capital assets, such as ownership of a tractor or a vehicle was consistently associated (although not significantly) with the decision to participate in the markets for horticulture and maize. At the same time it discouraged households from selling livestock and other field crops. Clearly, when households do own such assets they rather use them to sell high value commodities. In some instances it also promoted the selling of maize (although not significantly).

Table 5.11: Summary of factors of market participation

	Horticulture		Livestock		Maize		Other Field Crops	
Variable Description	Probit	Heckit	Probit	Heckit	Probit	Heckit	Probit	Heckit
Constant	-**	+	-	-	-	+	-***	-
Household Endowment								
• Size of arable land (ha)	+***	+***	-	+***	+**	+***	+**	+/-*
• Value of livestock (in R100)	-*	-*	+***	+***	+	+***	+	-
• Pensions earned (R)	-*	-/+	-**	-/+	-	+	+	-
• Non-farm earnings (R)	-	+**	+	+	-	-/+	-**	-***/+
• Owning a tractor or vehicle	+	-	-	+	+	+	-*	-*/+
Access to Information								
• Farming - extension visits	+**	+/-	-	-	+	+	+	-/-**
• Average hh education (yrs)	+	+	+	+	-	+	+	+
• Distance to nearest town	+	+***	+**	+	+	+/-	-***	-/+***
• Road to nearest town are good	+	-**	-	+**	+	+/-	+***	+**/ -**
Household Characteristics								
• Household head is female	-	-/+	+**	+***	-	-	-	-
• Age of household head (years)	+*	-**	+	+	+	-	+	+
• Household size AE	-**	-*	-**	-*	-***	-**	+*	+/-**
Interaction Factors								
• Proximity and road conditions	-	-	+	+*	+	+	+	-
• Education and non-farm earnings	-	-**	-	-	+	+	+	+/-

* = 10% sign level, ** = 5% sign level, *** = 1% sign level (Std errors in brackets)

Owning a tractor or vehicle did not stimulate households to sell livestock since livestock is typically walked to the market place, and information about the market is normally quite available and well spread. For poultry marketing the availability of a vehicle assists: using a “bakkie” to move around in order to approach potential buyers helps. Usually, one finds such sellers driving around villages with a salesperson at the back or in passenger seat announcing the sales with a loudhailer. Generally villagers are well acquainted with such vehicles. Another way of marketing is for the owners to take their poultry to flea markets or old age pension pay stations. In fact, pension earners buy a chicken there as a treat to the other household members.

Liquid capital assets such as pensions and non-farm earnings are not significantly important in influencing the decision to participate in markets. For example, earning pensions discourages the decision to participate in the livestock or horticulture market. This could link to the earlier point that was made, namely that pension earners prefer to buy a chicken on 'pay day'. Generally pensioners are likely to consume the livestock they rear or buy. Regarding the decision not to sell horticulture, it may be that most of pensioners do not have access to horticulture production facilities. Earning pensions also insignificantly discourages the decision to sell maize, but tended to encourage the sales of other field crops. Access to non-farm income significantly discouraged the sales of other field crops, and had an insignificant negative relationship with the likelihood of selling horticulture produce and maize. Although not significant, access to non-farm income tended to encourage participation in livestock markets.

The basic characteristics of the households provided a mixed pattern for stimulating the decision to take part in the market. The household size was the most consistent factor in influencing these decisions. It was significant in all instances of decisions. With the exception of the decision about selling other field crops, every additional member in the household reduced the chance of selling horticulture produce,

livestock or maize. This can be explained by the fact that household members must be regarded as consuming units. So, the more members a household has the higher the consumption requirements will be.

The age of the head of the household tends to influence households to decide to participate. Advanced age was found to be a positive and significant factor, particularly in the case of the horticultural market. Probably the contribution of experience through age of marketing systems is the salient factor. Households with female heads had a higher probability of selling livestock. This could be due to the fact that women tend to own small stock and poultry, which is relatively easy to sell. On the other hand, households with male heads were more likely to participate in horticulture markets, though not significantly so.

Average household education is a household characteristic associated with access to information. Being more educated does, however, not significantly influence the decision to participate in markets, which is contrary to the expectations. This variable is only negatively associated with the likelihood of selling maize. Similarly, (absence of) contact with extension services is only negatively affecting the likelihood of selling livestock. The presence of contact, however, significantly increases the chance of selling horticultural crops. Proximity to markets did not make any significant difference (although positive) in the likelihood of selling horticulture crops, but was significant in increasing the probability of selling livestock because animals are generally walked to the market, and a greater concentration of people provides a good market for poultry. Proximity to town is also important in encouraging a positive decision on participation in the horticulture and maize markets. Favourable conditions of the roads tend to increase the chance of participating in the markets, with the exception of livestock markets. Roads are not a significant factor since livestock does not require good roads. However, road conditions are significantly important for other field crop markets. The interaction of being closer to town with accessible roads and that of being educated and receiving a non-farm income were not significant in the decision to participate in the markets.

Once a decision to participate in the market has been determined, it follows to determine the level of participation.

5.7.2 Variable transaction costs in the level of participation

The modes for the levels of participation identified pertinent factors reflecting the role of variable transaction costs. Variable transaction cost factors determine the level of market participation in smallholder farming.

Similar to the decision to sell, a number of access factors influence the level of participation. Access to arable land significantly stimulates the level of participation among horticultural produce sellers and maize sellers. This asset encourages the level of livestock participation among livestock sellers as well as among other farming systems. Access to arable land tends to result in low participation in other field crops. This is true for all households. It did, however, increase (although not significantly) the other field crops sales among market participants. Ownership of livestock encourages participation in livestock and maize markets among market participants and other farmers. The value of livestock owned, however, discouraged the level of participation in horticulture markets for market participants only (with a positive non-significant factor for all households).

Access to capital assets, such as owning a tractor or vehicle did not influence the level of participation, except negatively in the case of the level of market participation re other field crops. The negative impact for other field crops implies that when households have a tractor or vehicle they will use these for other activities, which carry higher rewards.

In as far as liquid assets are concerned, access to old age pension is not important in determining the level of participation. It appears that those household members earning pensions are old and do not have much incentive to invest in markets. Generally their pensions earnings are used in meeting consumption requirements.

The other liquid asset such as non-farm income stimulated more participation in horticulture markets. This result follows from the fact that most of the households willing to sell more horticultural commodities have another business or some non-farm income. This non-farm income is required since every level of participation requires some investment. Access to non-farm income reduces the level of market participation in other field crops for participants. That is, households earning non-farm income are more likely to invest in horticulture markets than in other field crops markets.

Regarding access to information, proximity to town encourages participation in the horticulture and other field crops market for all households. Proximity was not significant for maize and livestock. This implies that in marketing perishable produce as in horticulture, proximity is more important than transport cost (bulkiness of maize). Access to good roads tends to increase the level of participation in the livestock market, but decreases that of horticulture. This negative effect on horticulture is based on the effect of the data obtained from the banana producers in Homo. They are located close to the nearest town, but the roads to get there are very bad. In other words, these data have skewed the findings.

Other variables related to access to information, such as education and contact with extension services are not important determinants of the level of participation. This confirms then the fact that they are attributes of fixed transaction costs.

The interactive effects of distance and road conditions did not significantly determine the level of market participation, except for the livestock sales. The interaction of information and access to assets tends to reduce the level of participation in horticulture. This is probably an outcome of the factor that the educated members of the household work elsewhere and, do not make time available for participation in the horticulture markets.

The household structure factors are gender and age of the head of the household and size the household. The household size generally reduces the level of participation, while female-headed households tend to sell more livestock (in Rands)

than male-headed households. There are no significant gender differences affecting the marketing levels of other commodities. Older age of the head of the household tends to reduce the level of horticulture sales.