African Journal of Agricultural Research Vol. 7(24), pp. 3525-3533, 26 June, 2012
Available online at http://www.academicjournals.org/AJAR
DOI: 10.5897/AJAR11.631
ISSN 1991-637X ©2012 Academic Journals

Full Length Research Paper

Policy options for improving market participation and sales of smallholder crop producers: A case study of the Free State Province of South Africa

S. Bahta[1]* and S. Bauer[2]

[1]Federal Research Institute for Rural Areas, Forestry and Fisheries, Johann Heinrich von Thünen-Institut, Bundesallee 50, Braunschweig, Germany.
[2]Department of Project Management and Regional Planning, Justus Liebig University of Giessen, 35390 Giessen, Germany.

Accepted 27 March, 2012

The paper identifies underlying factors behind farmers' market participation decisions and level of commercialisation of South African small scale farmers with a particular emphasis on transaction costs. The two-step decision making process is analyzed based on Agricultural Household Model that incorporates transaction costs using a Heckman selectivity procedure. The key importance of non price factors such as transaction costs over price factors come out clearly. Marginal effects are calculated and decomposed into market entry and intensity. The result showed that while both transaction costs and output prices are important for market entry and intensity; transactions costs have significant negative effects and have induced institutional innovations - such as belonging to farmers group and cooperating with white commercial farmers; and owning transport facilities are emerging to mitigate the costs of accessing markets. Consequently, price interventions to promote market access are likely to solicit a greater volume of additional supply from peasants entering the market for the first time. Overall, the findings clearly highlight the importance of non price policies to address explicitly the conditions of low productivity and low capital endowments of resources of poor farmers in order to promote surplus market supply and alleviate poverty.

Key words: South Africa, small scale crop farming, transaction costs.

INTRODUCTION

The need for promoting smallholder market participation has been increasingly recognized in efforts to bring about agricultural transformation in developing countries (von Braun and Kennedy, 1994) and is nowhere as evident as in Sub-Saharan Africa (Alene et al., 2007). However, subsistence agricultural producers, especially in sub-Saharan Africa (SSA) face several barriers that make it difficult for them to gain access to markets and productive assets. Hence, they remain to be among the poorest and most vulnerable of all groups. The most significant of these barriers are argued to be transactions costs—the observable and unobservable costs associated with arranging and carrying out a market transaction (Goetz, 1992; Staal et al., 1997; Holloway et al., 2000). These transactions costs barriers are far exceed those in any other region of the world and lead to marginalization of large number of African peasants from the cash economy. With a view to enhancing the efficiency of input–output markets, many countries in SSA have been introduced market reforms since 1980s. However, there is still a growing concern that service oriented public programs such as extension, input supply, and credit support have collapsed in response to the reforms (Jayne and Jones, 1997). This might have actually increased transactions costs in production and marketing rather than decreased.

In South African, several researches during the apartheid era, among others, Van Rooyen et al. (1987)

*Corresponding author. E-mail: Sirak.bahta@vti.bund.de.

and Kirsten (1994) have called for institutional reforms if agricultural market participation of black farmers in the commercial agricultural markets to be enhanced. Despite these calls, the policies of apartheid regime were rather discriminatory and the legacies of that era which led to dualism in agriculture still exist (Makhura, 2001). Unlike the well developed commercial farming, in the developing areas of South Africa, smallholder farmers find it difficult to participate in markets because of a range of constraints and barriers reducing the incentives for participation. These include, among others, access to assets, market information and training. An added factor is that farmers are located far away from the market and have poor access to infrastructure. Consequently, the inefficient allocation of resources such as land, labor and capital or market failure is abundant in many rural parts of South Africa.

The main objective of this paper is to investigate the extent to which transaction costs affect participation in crop markets by small holder farmers in the Free State province of South Africa. These costs create barriers or thresholds for small scale households to participate in crop markets, thus understanding in more depth the decisions involved with regard to market entry is important for policy.

The study is then motivated in modelling the decision to enter the output market which is potentially important in situations where many households rely on subsistence farming.

ESTIMATION PROCEDURE

In this study, the marketing behaviour is modelled as a two-step decision process: i) the household decides whether or not to participate in the market, and, ii) establishes how much to sell. The model is estimated using a Heckman procedure. This approach is adopted from Goetze (1992) in an attempt to address peasant self-selection into sellers and non-sellers. More specifically, reduced form equations both for market participation and quantities sold are estimated as this approach allows us to distinguish between the factors that determine whether or not to sell any output on the market at all, and the factors that influence how much peasants sell, given their produce for the market. In addition, the separation of the decision to sell from quantity supplied is motivated by the fact that the commodities under consideration are vegetables and food crops like maize where many key decisions are taken at planting time, rather than at harvesting (for example, cash crops). The other advantage of this approach is that it allows us to break down the marginal effects in the regression. However, there is little to say about the role of price as we are using cross-sectional data with relatively little price variation.

The econometric model which follows Heckman's estimation approach can be stated as follows:

$$s_i = \beta X_i + u_i \quad (1)$$

s_i is observed if $\gamma X_i + \kappa \tau_i + e_i > 0$ (2)

$$corr(u_i, e_i) = \rho \neq 0, \quad (3)$$

Where X is a vector of all the explanatory variables except fixed transaction costs (τ), β, γ, κ and ρ are parameters to be estimated. Subscript i indexes households and crop aggregation (total sales, sales of basic food crops, and sales of horticultural crops) is suppressed for notational simplicity. The error terms of the market participation and the sales equation are correlated and the correlation coefficient for the error terms u_i and e_i is represented by ρ where u_i and e_i are bivariate and normally distributed (Greene, 1993).

To better understand further the factors underlying the observed differences in market participation across the sampled households, investigating the extent to which the potential for enhanced commercialization and supply response differs between the sampled households is necessary. This can be done by estimating the marginal effect[1]. Marginal effects show the change in supply that would be induced by a marginal change in the exogenous variables (Heltberg, 2002). A number of different marginal effects can be derived which differ in interpretation, causing some confusion in the literature (McDonald and Moffitt, 1980). Marginal effects depend on regime selection and the appropriate choice hereof depends on the particular interpretation of interest. There are four different responses of marketing behaviour to changes in the explanatory variables in selectivity models (Huang et al., 1991; Heltberg, 2001). These are:

i) the marginal change in the probability of participating in the market as derived from the selection equation.
ii) the change in desired quantities transacted (for the full sample) that can be derived directly from the estimated parameters in the quantity equation. This is simply the coefficient associated with the variable in the output marketed supply equation. The parameter 'bcm' thus represents the marginal effects on potential supply.
iii) the conditional marginal effects (that is, given market participation) or the change in actual quantities transacted conditional on market participation, using information only for those already in the market.
iv) the total change in quantities transacted unconditional on market participation.

The unconditional elasticities of supply and demand are derived for the entire sample (as opposed to only those at the market), and they show the impact of parameters on observed (as opposed to 'desired') quantities. As unconditional effects refer to the expected change in actual quantities traded on markets are of key policy interest and are in focus in this study. Huang et al. (1991) show that for any variable x in the X vector, the unconditional marginal effect can be derived as:

$$ME^X = \frac{\partial s}{\partial x} = \beta^X \phi(\gamma X + \kappa\tau) = \gamma^X \phi(\gamma\chi + \kappa\tau)\left[X\beta + (\gamma X + \kappa\tau)\rho\right]$$

$$= \beta^X .psel + \gamma^X .\phi(xbsel).ycond \quad (4)$$

Where $\phi(\cdot)$ and $\Phi(\cdot)$ denote the standard normal distribution and density functions, respectively and *bx* and *gx* are the estimated parameters for variable *x* in the quantity and selection part of the model, respectively. The first part of expression (5) represents the change in quantity in response to a change in x (φx) weighted by the probability of being in the market (*psel* in Stata language); and the second part represents the change in the probability of being on the market [γx φ (*xbsel*)] weighted by the expected value traded if

[1] As these marginal effects are estimated from cross-section data, they are essentially short-run in nature. Since agriculture may respond with considerable lags, long-run supply elasticities will be more elastic with respect to prices and other factors than in the short run (Binswanger, 1990).

on the market (ycond in Stata terminology).

While the changes in the quantities transacted by participants weighted by probability of participation represent the total effects due to current participants, the changes in probability of participation weighted by expected quantities transacted by participants represent total effects due to new participants. All continuous variables have been transformed into (natural) logarithm and hence double log forms of supply were estimated. This facilitated the analysis and interpretation of the marginal effects on quantities transacted in terms of the unit-free elasticities, especially with respect to responses to output prices. In this paper, all marginal effects are evaluated at the mean of the data. Note that since the τ variables do not appear in the quantity part of the model, only part 2 of Equation 4 can be calculated. The basic purpose in this study is to apply a procedure that compensates for the fact that a large number of households do not participate in crop or livestock markets. Thus, using the framework of a Heckman or switching regression model (Maddala, 1983), the amount of output marketed can be estimated jointly with regime. For the crop sector, we focused on the choice between autarchy and selling regime as well as on the value of sales of crop outputs sold. Accordingly, following the modified conceptual framework, the model estimated has both selection or participation and a sales value component. Crop sale is not the only manner in which rural incomes and welfare may be increased. Yet, crop sales are important for incomes and productivity, especially considering the weakness of rural labor markets in many parts of Africa.

The use of aggregate value of crop sales as dependent variable is then motivated by a desire to use all available information in the data at hand, including information on those who sell other crops, than for example, maize only. Moreover, due to substitution among crops, some exogenous variables may increase individual crop sales at the expense of other crops. Although, it is well-established that single crop supply is more elastic than aggregate output supply, arguably aggregate supply is what ultimately matters to policy (Binswanger, 1990). The choice of aggregating over multiple crops forces us to work with values because quantities cannot be aggregated directly. Values resolve this by using market prices as implicit weights. While it is recognized as the potential interactions between horticulture crops and food crops are important, they are outside the scope of this study. In accordance with the major objective of the study, the variables hypothesized to explain crop market participation and marketed supply were identified based on the theoretical framework with fixed and proportional transaction costs, as described earlier and relying on past empirical work on market participation under transactions costs. 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. To determine factors affecting the two processes for each of the both sectors, a number of explanatory variables are specified to reflect the effect of transaction costs.

Transactions costs are important determinants of market participation, but they pose empirical challenges relating to measurement. First, when transactions costs are sufficiently high to prevent exchanges from occurring, then, by definition, these costs cannot be observed because no transaction has taken place. Secondly, even when a transaction takes place, transactions costs cannot be easily recorded in a survey (Key et al., 2000). This arises from the fact that farmers simply have no access to transport and communication services (that is, intermediaries) so that there would be no paid out costs to observe. Instead, farmers have to transport their products themselves using their assets and time in which case it would be difficult to measure the actual transportation costs. In situations where there are intermediaries for transport, information on transport costs incurred can be obtained, but the cost of total time spent on marketing is difficult to measure. Building on past empirical work, this study resorted to the (observable) factors that explain (for example, distance to nearest town which can explain the distance to input as well as output markets) or mitigate transactions costs (for example, cooperation with white commercial farmers and membership in marketing/farmer groups). Specifically, the transactions costs variables used were distance to nearest town, ownership of transport equipment, road condition to the nearest town, membership in the farm organizations or groups and cooperation with white commercial farmers. By increasing travel time and transport cost, market distance is expected to have a negative influence not only on market participation but also on the amount of output sold and is thus related to proportional transaction costs (PTCs).

A related variable is the conditions of the road to the nearest town. When the infrastructure is poor, farmers are generally discouraged to use it. And those who do use the infrastructure experience high costs. Hence, it is expected that the condition of a road that connected the farmers to the nearest town will not only influence market participation, but also the amount of crop sold. Travel cost in selling crops was measured by the distance in kilometres, however due to threshold effects; this was re-scaled into distant and non-distant markets based on the average distances. The other PTCs-ownership of transport is expected to enhance participation as well as quantity traded. Being a member of farm organizations is expected to essentially mitigate the fixed costs of accessing information and is thus expected to facilitate market entry. While cooperation with neighbouring commercial farmers is also expected to enhance market participation, whether this is through its role in accessing information (fixed transaction costs, FTCs) or in facilitating product transport (PTCs) is an empirical question. This is because farmers indicated dual roles of this variable: 1) gathering market and other technical information; and 2) transporting consumer goods and farm products from and to the market. Previous works in South Africa, for example, Makhura (2001) showed that small holder farmers who access distant markets have good cooperation with their neighbouring commercial farmers due to updated information on market. Moreover, Balint (2005) states that formal cooperation is the best correspondent for fixed transaction costs. Hence, it influences the decision of sales but not the amount sold.

The empirical approach proceeds by estimating and comparing the significance of two versions of the Heckman model, one with the variable used only in the first-stage relating to participation and another model with the variable used in both participation and supply equations. The preferred model would suggest the dominant attribute of cooperation with neighbouring white commercial farmers-information or transport attributes. The other variables used were to reflect household characteristics, information, access to assets and price variables. The household characteristics are constructed by three variables, that is, the age of the head of the household, the gender of the head of the household, the dependency ratio and the number of adult in the household. However, age of the household head and number of adults in the household is also an indicator of management capabilities and labor force (Balint, 2005), thus, they can be considered as production characteristics as well. The age of the head of the household normally provides a proxy for experience in farming. Further, these farmers will have stronger social network and credibility within the network. This implies that older heads are more informed about the marketing system. Household head age was measured in number of years. The gender of the head of the household 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 man and zero for female 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 taking the dependency ratio, which in turn is measured as the number of dependants (that is, infants and school children) per on farm worker (that is, non employed adults and pensioners) and number of adults, measured by the number of household members between the ages of 15 and 65, in the household. The number of adult is included to take account into consideration the labor supply for production. 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, contact with extension officers is crucial in order to make the decision to participate in the market. The variable is measured in terms of days a farmer is visited by an extension officer. It is hypothesized that the more visits the extension service provider pays to the farmers, the more likely the farmer would sell his/her produce and at the same time increase sales. 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 is measured by the average education of the household. Education is also an indicator of management capabilities, thus, it is hypothesized that educated farmers would sell his/her produce and at the same time increase sales.

The other construct of variable is access to assets or endowments of land and capital. This has been measured in terms of access to production assets (arable land, and livestock) and investment or liquidity assets (non-farm income, pension earnings). Farm size is measured as land per household worker (aged 15 to 60); potential for production in excess of consumption. 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. Ownership of livestock is measured in terms of LSU owned by the household. The last variable under this category is access to liquid assets which might be required to provide investment in market activities, such as paying for information and transport. It can be also an alternative to crop incomes. This was measured by the amount of income the household received from pension, business activities, service provision, salary and wage earning in hundred Rand units during the study period. The price variables used as regressors for crop market participation are the village mean farm gate prices of maize, the most important food crop, and carrots, a vegetable widely sold by many small holders in the Free State province in general and particularly by the sampled households, respectively. Because maize prices vary both across villages and through the extended harvest season, the output price data used here show considerable farm-level variability.

As price varies depending on the place and time of sale, it is potentially endogenous. Moreover, it is observed only for those farmers who actually sold maize or carrots during the study period. Therefore, average village-level prices were derived and used in the analysis based on observed village-wide prices.

SURVEY AND DATA

It is difficult to give precise rules on what sample size is suitable. The suitable sample does not depend on the size of the population nor does it have to include a minimum percentage of that population. However, Bless and Achola (1995) argue that one of the major issues in sampling is to determine samples that best represent a population so as to allow for an accurate generalization of results. A very important issue in sampling is to determine the most adequate size of the sample. That is the major criterion to use when deciding on the sample size is the extent to which the sample's size is representative of the population. Consequently, all five districts of the study area, namely, Motheo, Lejweleputswa, Thabo Mofutsanyane and Xhariep were selected. The reason for stratification is that:

i) Due to the policies during the apartheid era, small scale farmers who are predominantly black farmers are found wide spread across the province in what they call as home lands or town ships.
ii) To avoid differences in support services to farmers across the districts and administrations that might lead to different transaction costs.

Within each region, districts were selected randomly from a shuffled pile of district names. Within the district, extension wards (composed of villages) were also selected randomly from a shuffled pile. The face-to-face interviews are then conducted for 207 randomly selected farmers using standardized and structured questionnaires that were designed for collection of data from the selected farm households during 2006.

EMPIRICAL RESULTS AND DISCUSSION

Descriptive statistics

Table 1 presents the summary statistics of the variables, which characterize the sample households in Free State province of South Africa. One would expect that participating households are better endowed and have more access to liquid assets like income from other non-farm income[5] sources such as pensions and wages which might assist in leveraging market access. Participants and non-participants are not statistically different in terms of demographic characteristics such as household size, labour endowments, education and age of the head except with dependency ratio (Table 1). This study assumes, however, that certain socioeconomic, wealth and spatial characteristics might also play important roles in people's decisions to sell or not to sell. Non participants have higher dependency ratio than participants. This might lead to more of the production to be used for household consumption. A stronger endowment position relates significantly to access of arable land and the ownership of a tractor. Endowment in terms of human capital (education, age, and extension), also, does not vary significantly among the groups. It is found, though, that market participants seem to have access to better roads. This superior accessibility to good roads might have assisted in providing better access to information and thus to market opportunities.

Collective action as measured by belonging to farmers' organizations is expected to strengthen farmers bargaining and lobbying power and facilitate obtaining institutional solutions to some problems and coordination. Cooperation with white commercial farmers is also assumed to lower transaction costs as it enhances opportunities for information sharing. White commercial farmers have access to services and profitable markets; this is a valuable resource that can promote market participation. There is a significant difference between

Table 1. Comparing explanatory variables for crop sellers and non-sellers (N = 207).

Variable	Non sellers (N = 134)	Sellers (N = 73)	F
Carrot price	2.72	3.3	20.1***
Maize price	0.89	0.96	2.98*
Arable land per capita (ha)	0.21	1.33	16.21*
Herd size (TLU)	8.9	6.1	2.07
Extension contact	6.46	7.45	0.47
Gender (1 = male)	0.2	0.3	2.44
Age of household head (years)	57	55	1.31
Education of household head	5.78	6.44	1.24
Dependency ratio	1.6	0.93	10.01***
Non- farm income	1038	1010	0.01
Adults in the household (number)	3.07	3.38	1.75
Own tractors (yes)	0.033	0.28	29.15***
Own vehicle	0.33	0.21	3.85*
Road condition (good or average = 1)	0.6	0.86	9.98**
Distance to nearest town (yes = >19 km)	19.38	18.9	0.04
Group membership (yes = 1)	0.37	0.64	13.8***
Cooperation (yes = 1)	0.13	0.33	13.01***

F -statistics are ANOVA tests; significant level (1% = ***, 5% = **, 10% = *).

Table 2. Factors influencing the decision to sell crops: selection results (N = 207).

Variable	Participation	T- statistics	Change in probability
Carrot price	2.044***	4.09	0.076***
Maize price	-5.196***	-3.44	-0.012***
Arable land per capita (ha)	1.077***	6.57	0.041***
Herd size (TLU)	-0.047	-0.51	-0.004
Extension contact	-0.121	-1.12	-0.002
Gender (1 = male)	0.074	0.29	0.004
Age of household head (years)	-0.922**	-2.09	-0.028**
Education of household head	-0.014	-0.08	0.003
Dependency ratio	-0.071	-0.85	-0.003
Non- farm income	0.003	0.11	0.001
Adults in the household (number)	2.104***	4.48	0.082***
Own transport (yes = 1)	1.121**	2.55	0.038**
Road condition (good or average = 1)	-0.012	-0.04	-0.004
Distance to nearest town (yes = >19 km)	-0.515**	-2.19	-0.022**
Group membership (yes = 1)	0.578**	2.62	0.024**
Cooperation (yes = 1)	1.084***	4.01	0.037***
Constant	2.72	1.14	
N	207		

Significant level (1% = ***, 5% = **, 10% = *).

participants and non participants with regard to the aforementioned two variables. On average, 64 and 33% of the participants cooperate with white farmers and are member of farmers' group organization, respectively. It is also found that market participants seem to be located closer to the nearest market centres or towns than non-participants, and also has access to better roads. This proximity (and superior accessibility) to the markets might have assisted in providing better access to information and thus to market opportunities.

Crop market participation

The results of probability model and the annual value of sales given market participation are estimated jointly, however, the results are presented separately (Tables 2

Table 3. Factors influencing the level of crop sales: quantity results.

Variable	Marketed supply	T-statistics	Change in elasticities of observed supply
Carrot price	-0.760	-1.15	-0.760
Maize price	3.920***	3.01	3.920**
Arable land per capita (ha)	-0.370	-1.42	0.370*
Herd size (TLU)	-0.102	-0.93	-0.102
Extension contact (days)	0.668***	5.73	0.668***
Gender (1 = male)	-0.199	0.77	-0.200
Age of household head (years)	-0.322	-0.67	-0.322
Education of household head	-0.080	-0.53	-0.080
Dependency ratio	-0.323***	-3.67	-0.323***
Non- farm income (Rand)	0.057**	2.34	0.057**
Adults in the household (number)	-0.616	-1.12	-0.616
Own transport (yes = 1)	-0.250	-0.62	-0.250
Road condition (good or average = 1)	0.582*	1.67	0.582*
Distance to nearest town (yes = >19 km)	0.382	1.23	0.382
Constant	5.787**	2.17	
p (selectivity parameter)	0.754		
X^2 - test for independent equations (p = 0)	5.960		
p-value	0.0147		
Number of sellers	73		

Significant level (1% = ***, 5% = **, 10% = *).

and 3) in order to explain the differential impact of explanatory variables on dependent variables. The results of change in probability and change in elasticities are reported in the second column alongside marketing probability model and the annual value of sales given market participation in Tables 2 and 3, respectively. According to Table 3, the selectivity parameter, ρ, is significantly different from zero in the regressions for all crops combined. This means estimating jointly the equations for selection or decision to sell equation and the volume of sales as it is indicated earlier is correct. The price of carrot (the most important horticultural crop), size of arable land, ownership of transport means, the number of adults in the household, group membership and cooperation with neighbouring white commercial farmers increased the likelihood of households selling crops (Table 2). However, the price of maize (the most important food crop), the age of the household head and distance to the nearest town negatively affected the likelihood of households to sell crops. The price of carrot, size of arable land, and the number of adults in the household positively and significantly increases likelihood of both food and cash crop market participation. And dependency ratio was found to decrease the likelihood of both food and horticultural crop market participation.

In addition, cooperation with neighbouring white comercial farmers and age of the household head has positive and negative effect on the likelihood of food crop participation and cash crop market participation, respectively. From Table 2, the price of carrot and number of adults in the household have the highest marginal effect on the probability to sell crops followed by size of arable land, ownership of transport means, group membership and cooperation with commercial farmers consecutively. Despite the fact that price responsiveness is hard to identify accurately in cross-sectional data, a 1% increase in carrot price increases the likelihood of crop selling among sellers by 7.6%. This shows that more farmers enter the market if there is good price of vegetables in the market. This can further be motivated by the fact that most of these farmers in South Africa in general and in the Free State province in particular are engaged in small vegetable farming and most of them sell to individuals or hawkers around the village or nearest town. Farm households with more number of adults have 8.2% higher probability of market participation. Considering the labor demand of horticultural crops, this can have impact on the amount of crop produced in the household which can also affect market participation. The size of arable land significantly positively increases market participation.

A 1% increase in arable land size increases the probability of market participation by 4.1%. Indeed, large land size can decrease input purchase, production and sales related transaction costs due to the advantage of economies of sales and since the household does not need to use the land markets to increase its land size. Moreover, the larger the land size, the more it allows the household to have a surplus production above the subsistence needs and be able to sell. This also mitigates the negative impact of dependency ratio on the likelihood of sales as households with high dependency ratio sought less likely to sell their crops. Since most of the

crop products are either bulky as in the case of grains or perishable as in case of horticultural products, households who own transport means or live near towns and have access to good road conditions are likely to sell. This also allows households to overcome the transaction costs, particularly fixed transaction costs that prohibit farmers from participating in crop markets and in accessing distant markets. An encouraging development worth noting is the recognition of the importance of social capital as represented mainly by the percentage of sample farmers belonging to farmers' organizations and the co-operation some sampled farmers receive from their white commercial farmer counterparts. According to Table 3, farmers who are members of group organization and cooperate with neighbouring white commercial farmers have higher probability of sales than farmers who are not members of group organization and do not cooperate with neighbouring commercial farmers.

The value of livestock owned by the households showed unexpected result. That is, ownership of additional livestock decreases the probability of crop sales. This could be due to the fact that most of these households are engaged in horticultural crops, which are labor and time demanding as the livestock farming is. This implies that households need to devote more time to livestock production rather than spending it on selling and horticultural crops. And 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 crop activities, especially such as horticultural activities. Although, it can be argued that old farmers are more likely to participate in crop markets due to better market information and experience they have, our finding is the opposite. Market participation declines with age, indicating that such characteristics of older farmers as risk aversion and reluctance to adopt technology and hence inability to produce for the market dominate the expected greater market contacts and trust that would allow them to trade at lower costs.

Crop supply response

The price of maize, arable land size, extension contacts, off farm income and road condition to the nearest town positively increased the amount of sales in crop markets. Unlike in the probability results aforementioned, dependency ratio negatively affected the amount of crop sales (Table 3). The results imply that factors alleviating transaction costs leading to higher volume of crop sales are to do with access to information and to production assets, while households with higher dependency ratio exacerbated the costs. Consistent with the observation that many farmers sell some food crops right after harvest to satisfy their cash needs, maize price does not influence crop market participation decisions. However, marketed supply increases with maize price, once participation decisions are made. The results show that the conditional price elasticity of marketed supply is 3.91, implying that a 1% increase in maize prices increases maize supply by 3.91% among sellers. Access to good or average roads has the higher elasticity on crop sales among households participating in the market. The results suggested that having access to good or average roads would increase sales of crops by 58%. A 1% increase in the size of arable land increases crop supply around 37% among the sellers. This implies a need for motivation to speed up the provision of more arable land to crop farmers.

Having contact with extension service increases crop supply by 66% among the sellers. This demonstrates the critical role of technology and support services in promoting marketed supply among smallholders. That is, once farmers decided to participate in market, information supply from extension officers is critical to overcome the transaction costs (variable transaction costs) that increase proportionally with the amount of sales. Access to off farm income increases the amount of crop sales by 5.3% among sellers. 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 crop markets since non-farm income can function as a substitute for selling. However, when the farmers are already selling crops, then non-farm income can be used to mitigate some variable transaction costs, for instance transportation cost. Households with high rate of dependency ratio still remain to have difficulties in overcoming transaction costs, so as to supply more crops or commercialize. An increase in dependency ratio by 1% leads to a decrease in crop supply by 32%, other things remains the same. Other factors were not significantly affecting level of crop sales. They included the age, gender, education, herd size and ownership of transport means. Ownership of transport means only increases the decision to participate in crop markets but not the amount of crop sold.

This is because households which are in a position to access amenities such as transport means prefer to use them for other activities rather than to extend their crop activities. For example, it was found during the survey that many farmers prefer to use their vehicles as taxi, where they earn more than spending their time in extending their crop activities. The relationship between the exogenous variables and output marketed supply can be assessed either conditional on selling crop at the time of the survey, or unconditionally for the entire sample. Unconditional marginal effects capture the joint impact of a variable on the changes in the probability of market participation and in the level of marketed supply. Table 4 reports the unconditional marginal effects calculated at the mean, and reports separately the effect on unconditional marketed supply that is due to change in participation and change in marketed supply. Because of the double log specification of the model, the marginal effects essentially represent elasticities. One of the issues of interest in studies of elasticity of supply is price elasticity

Table 4. Unconditional total elasticities of crop marketed supply and decompositions.

Variable	Total expected change in sales (%)	Total change through new participants (%)	Total change through current participants (%)
Log carrot price	0.004	0.007	NS
Log maize price	-0.001	-0.001	NS
Log arable land per capita (ha)	0.227	0.27	0.02
Adults in the household (number)	0.448	0.073	0.413
Own transport (yes = 1)	0.027	0.042	NS
Distance to the nearest town (yes = >19 km)	-0.01	-0.005	NS
Group membership (yes = 1)	0.013	0.002	0.003
Cooperation (yes = 1)	0.027	0.004	0.006

NS = non significant.

elasticity, especially under transactions costs. Consistent with the earlier result that farmers consider factors other than prices in their decision whether to sell output, market entry does not contribute to the total elasticity of crop supply. There is thus, evidence of a small but positive and significant supply response among smallholders. The advantage of the selection model used in this study is that a distinction is made between the total or unconditional elasticity estimate of 1.76 and the conditional elasticity of 5.87.

The substantial difference between the estimate for all farmers and that for sellers confirms the low level of market participation among smallholders. The high conditional elasticity suggests that output price can be an effective policy instrument to increase marketed surplus among sellers. However, given that output price have their largest effects on promotion of market entry; interventions that raise prices are also a good mechanism to encourage farmers to enter into the market. Similarly, ownership of transport facilities and distance to the nearest town seem to be stronger on total supply through promotion of market entry. The elasticity decompositions demonstrate that all factors have their largest effects on total supply through promotion of market entry. As critical inputs in crop production, labor availability (number of adults in the household) and land per capita have the first and second largest total elasticities of supply of 0.44 and 0.22, respectively, with over 80% for arable land size being due to market entry-through the participation of more farmers in crop markets. Similarly and consistent with earlier result, the proxies used for transport and information costs are the major impediment in market participation. Factors that are used as a proxy for transportation and information costs show their largest effect on total supply through promotion of market entry or market participation. Ownership of transport facility as a basic in reaching distant markets, it has a significant elasticity of crop supply of 0.024, with all effect being on market entry. Likewise, remoteness or staying far from the nearest small towns reduces supply by 10%, with all the effect on market entry.

The result that the effects of all variables except arable land and labor availability on marketed supply are through market entry, relative to that through increased supply among participants, brings out an interesting implication that a successful commercialization policy is one that brings a large proportion of the peasant population into the realm of markets through, for example, improved market information, support services, access to productive assets like land and infrastructure.

CONCLUSIONS AND IMPLICATIONS

The results revealed that transactions costs have significant negative effects on market entry and intensity and have induced innovations to mitigate both fixed and variable costs of accessing markets. Rising information and related costs in the output markets therefore explain the limited output supply response. The transactions cost barriers could be reduced through improved information and transportation infrastructure, deeper penetration of output markets, and promotion of institutional innovations such as production and marketing cooperatives. Indeed, the results provide evidence that institutions such as farmer organization and cooperation among small and large scale farmers are emerging to mitigate transactions costs and to promote market transactions. Thus, both price and non price factors are equally important in enhancing crop market participation. In summary, the findings suggest that policy options are available other than price policies to promote agricultural market participation and sales. This is important because, in the short run, higher prices are likely to benefit few farmers only, impose costs on buying households unable to respond to price incentives and bypass those failing to participate in markets because of high transactions costs. Therefore, price policies will have very different behavioral and welfare implications for different sub-sectors of the farm population.

In the face of the food price dilemma facing many countries in SSA, policies that reduce transactions costs are

thus important alternatives to price policies to promote marketed surplus.

REFERENCES

Alene AD, Manyong VM, Omanya G, Mignouna HD, Bokanga M, Odhiambo G (2007). Smallholder market participation under transactions costs: Maize supply and fertilizer demand in Kenya. Food Policy, 33(2008): 318-328.

Balint B (2005). Market Channels and Commercial Orientation in Romania. In: Brosig, S. and H. Hockmann (eds.): How effective is the invisible hand? Agric. Food Mark. Cent. East. Eur., 31. 249-268.

Binswanger HP (1990). The Policy Response of Agriculture. Proceedings of the World Bank Annual Conference in Development Economics. pp. 231-58.

Goetz SJ (1992). A selectivity model of household food marketing behavior in Sub-Saharan Africa. Amer. J. Agric. Econ., 74(2): 444-452.

Heltberg R (2001). Commercialization and specialization in Mozambican agriculture. Institute of Economics, University of Copenhagen, Copenhagen, Denmark.

Heltberg R, Tarp F (2002). Agricultural Supply Response and Poverty in Mozambique. Food Policy, 27(1): 103-124.

Holloway GJ, Charles N, Delgado C, Staal S, Ehui S (2000). Agro industrialization Through Institutional Innovation: Transaction Costs, Cooperatives and Milk-Market Development in the East African Highlands. Agric. Econ., 23: 279-88.

Huang CL, Raunikar R, Misra S (1991). The application and economic interpretation of selectivity models. Amer. J. Agric. Econ., 73(2): 496-501.

Jayne TS, Jones S (1997). Food marketing and pricing policy in eastern and southern Africa: a survey. World Dev. 25(9): 1505–1527.

Key N, Sadoulet E, de Janvry A (2000). Transactions costs and agricultural household supply response. Amer. J. Agric. Econ., 82(5): 245–259.

Kirsten JF (1994). Agricultural Support Programmes in The Developing Areas of South Africa. Unpublished PhD thesis. Pretoria: University of Pretoria.

Maddala GS (1983). Limited-dependent and qualitative variables in econometrics. Cambridge University Press, Cambridge.

Makhura M (2001). Overcoming transaction costs barriers to market participation of smallholder farmers in the Northern Province of South Africa. Unpublished Ph.D. thesis, University of Pretoria, Pretoria.

Staal S, Delgado C, Nicholson C (1997). Smallholder dairying under transactions costs in East Africa. World Dev., 25(5): 779-794.

van Rooyen CJ, Vink N, Christodoulou NT (1987). Access to the agricultural market for small farmers in Southern Africa: The farmer support programme. Development Southern Africa. 4(2): 207- 223.

Vink N, van Zyl J (1998). Black Disempowerment in South African Agriculture: A historical perspective. In Kirsten, J., van Zyl, J. & Vink, N. (eds). The Agricultural Democratisation of South Africa. Cape Town: AIPA/Francolin Publishers.

von Braun J, Kennedy E (1994). Agricultural commercialization, economic development and nutrition. John Hopkins University Press for the International Food Policy Research Institute, Baltimore and London.