OVERCOMING TRANSACTION COSTS BARRIERS TO MARKET PARTICIPATION OF SMALLHOLDER FARMERS IN THE NORTHERN PROVINCE OF SOUTH AFRICA

by

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Dedication

To all agricultural economics students and the smallholder farmers in the African continent

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The only viable way of completing a project of any significant magnitude is to partly relinquish control to others. My thesis was not an exception to this rule. I, therefore, share the ownership of this work with several others and wish to acknowledge their contributions.

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Nna ke **Moraka' Makhura'** *Molaba' Tšhukudu*
Nkabe bahu ba tsoga, be re tlo bitša Babirwa le Ditlou ka maina;
Ra re Moraka le Mokgadi tsogang!
Mochipisi le Mososomedi batamelang!
Molatelo le Moleboge fahlogang!
Moba le Mphalane emelelang!

Le bone Moraka a ngatha 'tshola sa makgowa,
Sa inong a iša le BoNakedi le BoSethothi le BoMabu,
Ge e le sefoka ra iša Sione 'a mmamekete ra keteka!
Dikgadi hlabang mokgosi le re Babirwa,Sione Weeeeee!

Moraka T Makhura
Pretoria, South Africa
June 2001

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ABSTRACT

The objective of this study is to investigate the role of transaction costs in determining market participation of smallholder farmers. It is expected that the identification of these transaction cost factors could assist in the formulation of policy interventions and/or institutional innovations to alleviate constraints on market participation and improve the ability of these small-scale farmers to become part of the commercial agricultural economy. Transaction costs differ between households due to asymmetries in access to assets, market information, extension services and remunerative markets. The study particularly investigated the factors contributing to different levels of transaction costs amongst households.

The main hypothesis of the study is that small-scale farmers facing lower transaction costs will participate more in agricultural markets. Transaction costs reflect the character of the market, but are mainly embedded in the characteristics of individual households and their economic environment. In order to test the hypothesis, selectivity models identifying and testing

significant factors related to market participation are applied to a survey of 157 farming households in the Northern Province. These households take part in the markets for horticulture, livestock, maize and other field crops. The selectivity models used involve two-step estimation similar to the Heckman's two-stage procedure.

The study reveals that access to assets and market information in combination with particular household characteristics are important determinants of market participation. Among the assets of a household, a reasonably sized area of arable land tends to encourage participation in all markets, apart from the market for other field crops market. Ownership of livestock tends to stimulate livestock selling and also the level of maize sales. Ownership of arable land and livestock contribute to the economies of scale of production, which leads to lower transaction costs per unit output sold. Non-farm earnings only alleviate variable transaction costs in horticultural markets, but not in other field crops markets. Pensions discourage participation in high value commodities markets since they are viewed as alternative cash income.

Indicators enhancing the role of information access include proximity to markets and contacts with the extension service. Proximity to markets reduces variable transaction costs in horticultural markets and fixed transaction costs in livestock markets. The study shows that every kilometre closer in proximity to markets, the horticultural sales increase by R152. Proximity and contact with extension services discourage participation in other field crops markets. Good road conditions reduce transaction costs for livestock and other field crops. The study also shows that in spite of bad road conditions some horticulture farmers still manage to market most of their products.

A larger sized household tends to increase the transaction costs in marketing all commodities except for the other field crops. Female farmers tend to participate more in livestock markets as they own small livestock and poultry that are easy to sell, and keep livestock for livelihood purposes rather than for social status. On the other hand, female farmers appear to be constrained in

their participation in horticultural markets, ostensibly due to problems of access to irrigation resources and cultural and legal perceptions. Older farmers with enough social capital are willing to sell, but in horticulture and maize they tend to sell lower quantities.

The study raises issues which, when attended to, might reduce the transaction costs, particularly by enhancing access to information and providing endowments to farming households. Some constraints require direct policy measures, such as policies dealing with land reform, extension services, education and legal reforms, and then there are those that require indirect intervention and private sector involvement such as road networks and market availability.

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CHAPTER ONE

INTRODUCTION

1.1 OBJECTIVES

Commercialisation of subsistence agriculture implies increased participation, or, rather, an improved ability to participate, in output markets. In the developing areas of South Africa, like in other developing countries, smallholder farmers find it difficult to participate in markets because of a range of constraints and barriers reducing the incentives for participation. These may be reflected in hidden costs that make access to markets and productive assets difficult.

Transaction costs, that is, observable and non-observable costs associated with exchange, are the embodiment of access barriers to market participation by resource poor smallholders (Coase, 1960; Delgado, 1999; Holloway et al, 2000). These include the costs of searching for a trading partner with whom to exchange, the costs of screening partners, of bargaining, monitoring, enforcement and, eventually, transferring the product to its destination (Jaffee and Morton, 1995; Hobbs, 1997). Transaction costs, however, do not only include the costs of the exchange itself, but also encompass costs associated with the reorganisation of household labour and other resources in order to produce enough for the market.

The main objective of this study is to investigate the extent to which transaction costs affect the market participation behaviour of smallholder farmers in the Northern Province of South Africa. The identification of these transaction cost factors could assist in identifying policy interventions and/or institutional innovations to alleviate constraints and improve the ability of small-scale farmers to be part of the commercial agricultural economy. Transaction costs differ between various households due to asymmetries in

access to assets, information, services and remunerative markets. The study will therefore also investigate the factors contributing to different levels of transaction costs amongst households.

The specific objectives of the study are:

- to identify underlying transaction cost factors influencing household behaviour in market participation in the Northern Province of South Africa,
- to identify factors that influence the decision of these farmers to participate in output markets,
- to identify factors that could contribute to increased participation in agricultural output markets, and
- to make recommendations to support policy formation and implementation of agricultural development programmes.

Thus, this study aims to find ways of accelerating the participation of previously disadvantaged farmers into mainstream agriculture. It attempts to assess the extent to which institutional factors, particularly transaction costs, are responsible for a low participation rate, and attempts to explain this. The study also aims at suggesting ways to create an appropriate environment for emerging farmers to contribute to rural growth.

1.2 JUSTIFICATION

South Africa continues to strive for empowerment of those who were denied opportunities under apartheid. The process of empowerment is about giving disadvantaged communities and individuals more choices, and, in the case of agriculture, removing the dualism and fully integrating and democratising the sector (Kirsten, van Zyl and Vink, 1998). This process is important both for sustainable economic growth and for the alleviation of poverty and inequality.

Various efforts to promote small-scale farming have been noted in the past decade. It remains evident, however, that much more needs to be done to make a positive difference in terms of the political objective of an integrated

agricultural sector. Integration will only happen when smallholder farmers fully participate in the market.

Farmers in the neglected and less developed rural areas are generally poor. According to a discussion paper on food security (DALA, 1997; MALA, 1998), many households are vulnerable to food insecurity. Unemployment is high and tends to rise as household members lose jobs in the urban centres. Farmers in these areas are not really part of commercial agriculture. This is one of the reasons that the contribution of smallholder agriculture to the gross national product is still limited in South Africa. The majority of disadvantaged farmers is not part of mainstream agriculture and practises subsistence agriculture in overcrowded, semi-arid areas in the former homelands. This kind of subsistence farming is characterised by low production (and productivity), poor access to land, and poor access to inputs and credit. In order to generate enough income these farmers tend to engage in off-farm (or non-farm) income generating activities.

It is, however, possible for smallholder farming to survive economically when given a set of opportunities. After all, subsistence farmers are used to take rational decisions in order to adapt to conditions they find themselves in. For example, given a set of resources, farmers will strive to optimise production. Another particular and critical set of opportunities involves opening access for smallholders to interact with other economic agents.

To a large extent the process of agricultural transformation in South Africa involves moving households from subsistence production to producing for the market. Producing for the market provides a number of benefits and advantages. In particular rural employment is promoted and income is generated (Ngqangweni, 2000). The commercialising environment provides a potential for increased production and thus for improving food security for the rural poor. Furthermore, several studies (Ngqangweni, 2000; Delgado, Hopkins, Kelly *et al*, 1998) have shown positive and strong multiplier effects of investing in agriculture. In other words, agriculture has an important role to play in fostering rural development and poverty alleviation. It is through

commercialisation of smallholder agriculture that the previously disadvantaged groups can become a significant part of the economic base of rural economies.

Very few smallholder farmers participate in the markets. A range of impediments for market participation has been identified. They include lack of assets, market information and training. An added factor is that farmers are located far away from the market and have poor access to infrastructure. Several studies (Van Rooyen, Vink and Christodoulou, 1987; Kirsten *et al*, 1993; and Kirsten, 1994) have in the past referred to the need for structural reform if participation of black farmers in the commercial agricultural sector is to be enhanced.

It is to be appreciated that efforts to promote structural change, such as land reform, improved access to credit and a number of markets, have benefited some, albeit a small minority of black farmers. But these reforms have not been sufficient to improve the participation in commercial agriculture of the majority of subsistence and emerging farmers.

There are transaction costs barriers to participation that can only be overcome by institutional innovation. Research is therefore needed to identify policy options that will stimulate the transition of smallholder farmers to become commercial operators. This study aims to propose ways to alleviate or remove constraints that inhibit participation in agricultural markets.

1.3 BACKGROUND

1.3.1 Exclusion of smallholders from markets in South Africa

South Africa is classified as an upper middle-income country (World Bank, 1997). A number of studies conducted in South Africa, however, show high levels of poverty in rural South Africa. According to the poverty report (1998) just under 50% of the population (that is about 19 million people) live in the poorest 40% of households and are thus classified as poor. It is striking to

note that a majority of the poor are located in predominantly rural provinces, such as the Northern Province and Eastern Cape. These provinces have poverty rates of about 70% and 60% respectively. In particular, poverty is manifest in the former homeland areas where Africans are located. These homelands emanated from the separate development policies initiated at the beginning of the twentieth century. Under these policies the former homeland areas were provided with inadequate infrastructure and services. Generally, farmers in these areas had poor access to resources such as land, credit facilities and technology (van Rooyen, 1995).

The process of exclusion must be seen in its historical context and has caught several authors' attention. Terreblanche (1998) and Vink and van Zyl (1998) have provided an historical account of how the exclusion started in the beginning of the century as white monopoly got established in both the political and economic sectors. In the process, blacks were kept in the fringes of socio-economic development. In agriculture, the unfairness of the system came to light when the Tomlinson recommendations were tabled espousing the improvement of conditions for blacks in the reserves (Houghton, 1956; Kirsten, 1994), which, incidentally, were not accepted by the then government (Anonymous, 1956; Kirsten, 1994). Instead it was viewed that the exclusion of blacks, then referred to as indigenous people, from the markets had to do with realistic physical conditions such as transport and climate, but mostly depended on their unwillingness to integrate into a western economic system (Anonymous 46, 1957). This resulted in different agricultural policies being applied to white commercial agriculture and to black small-scale farmers in the homelands (Vink, Kirsten and van Zyl, 1998) which changed land use patterns and affected farm incomes for both groups of farmers(*ibid*, 1998; D'Haese and Mdula, 1998).

Because of the restrictive setting in the homelands, households largely depended for their income on jobs in areas reserved for whites. Many households attempted multiple coping strategies to provide for their livelihood (Mekuria & Moletsane, 1996; May, 1998). For example, members of a household would be involved in subsistence farming on small plots, and at the

same time they would commute or migrate to and from the place of work. Despite the effort put into it, these activities could not provide enough income to move households out of poverty. In turn this had negative implications for food security. In general, however, small-scale farming has always been the mainstay of coping strategies in food security. Parallel to the poverty pattern mentioned earlier, most of the vulnerable households are located in rural provinces such as the Northern Province.

1.3.2 Smallholders can survive economically

Small-scale farmers have continued to produce in the face of unfavourable conditions. In fact, one of the paradoxes of existence of smallholder farmers pertains to their sustainability in spite of harsh circumstances. In South Africa, the small-scale farmers have subsisted on “uneconomic farm units” as a result of the Land Act of 1913 that excluded small-scale farmers from owning land. Moreover, these farmers have had very limited support services, which made it difficult for them to operate economically.

In line with Schultz’ hypothesis of small but efficient, several studies have established that smallholder farmers do have comparative advantages in the use of resources (Ngqangweni, 2000; McIntire and Delgado, 1985), implying that they use resources efficiently, that is, resources are not wasted. The study by Ngqangweni has shown what kind of activities smallholders in the Eastern Cape could pursue profitably and with an acceptable level of efficiency. Some of the activities, such as indigenous beef and citrus production, showed considerable potential and good opportunities under low fixed-cost technologies and irrigation conditions. Heavy infrastructure investments boost the 'per unit costs' but better marketing arrangements lower transaction costs, and this boosts the returns to the farmer and consequently to society as a whole.

In general small-scale farmers have the advantage of flexible family labour resources and can allocate labour to activities with higher marginal returns. For example, dryland low-value farming is normally left for the old men and

women since able-bodied men and women are involved in migratory jobs, and younger children go to school. When farming returns increase, for example through access to more land, or irrigation, more household members are involved and supplement this with hired labour. In this way a number of smallholder farmers make profits and are able to survive economically. Pertinent characteristics of such farmers are access to market, information and assets.

1.3.3 Smallholders survival creates linkages for economic growth

As mentioned before, smallholders dominate the former homeland rural areas. Where these farmers are active and successful, other non-farm economic activities emanate as a result. Successful smallholders create a demand for non-farm sector goods (retail). This is apparent in many rural settings of South Africa. For example, a typical sample village will have a retail store located close to arable lands. Small rural towns with more non-farm business enterprises are located adjacent to thriving farming activities (normally irrigated farming). So, the linkages with other sectors get stronger when farming can generate more income, and this, in turn, is a direct result of market participation.

In his study, Ngqangweni (2000) established that consumption- or demand-side linkages which are derived from supported smallholder agriculture in the Eastern Cape Province matched those recorded in studies of similar situations in Africa and Asia (Delgado *et al*, 1998). These linkages were strengthened by cash inflow into the rural areas in the form of non-farm incomes from urban areas. The study asserts that the relationship provides opportunities for tradable smallholder agriculture to be a significant source of the required initial income injection, which comes from sale of local agricultural tradables. These arguments provide an additional motivation why it is important to improve the productivity and increase the level of sales of small-scale farmers. Through these increased levels of income as a result of increased sales, farmers stimulate a range of non-farm activities in the economy, which provide job opportunities for the rural poor. However,

increasing on-farm productivity and increasing the level of sales are hampered by several constraints.

1.3.4 There are transaction costs barriers that require new institutions

A range of constraints and barriers limits smallholder participation in the agricultural market. As a result most of the smallholder products are wasted after harvesting or sold at very low prices. Because of the uncertainty about prices, many farmers would take any price offered by buyers when there is a chance to participate. Farmers generally do not have the required information and means to locate better markets. Many a time reliable markets are located further away and are difficult to access. Only farmers with assets such as vehicles are able to move around in search of a better market. When one visits market centres, it is not uncommon to meet farmers who used their own vehicles to get to the market. These farmers are also better informed about various buyers and are normally well connected with neighbouring (white) farmers. There is frequent road traffic between white farms and communal villages where smallholder farms are located. This implies that farmers with assets can interact more effectively; on the other hand it also means that the majority of small-scale farmers are out of touch with these markets.

It is, thus, evident that a range of transaction cost barriers prevents small-scale farmers from participating in commercial markets. It follows that this lack of commercial activity by small-scale farmers does, ultimately, not lead to any of linkage benefits as anticipated. There is therefore a need for alternative institutions that can overcome barriers to market participation. In other parts of Africa (such as Ethiopia) farmers have the alternative to use brokers to market their grain (Gabre-Madhin, 1999). In South Africa, however, some farmers (particularly maize producers) tend to engage institutions such as co-operatives and millers to take their grain for processing, and storage, and these sometimes provide transport services. Despite this a large proportion of this grain is consumed and only a minor portion is sold, implying the persistence of barriers to remunerative options.

Research is therefore needed to identify and suggest policies and strategies to overcome transaction cost barriers. This is based on the argument that transaction costs prevent market participation. Furthermore it is expected that such research will show which the policy interventions most needed are.

1.4 HYPOTHESES

The main hypothesis of the study is that farmers facing lower transaction costs will participate more in the agricultural markets than those farmers facing high transaction costs. These transaction costs reflect the character of the market, but are mainly embedded in household characteristics and their economic environment. As a consequence farmers respond to market barriers by opting for alternative market institutions.

The specific hypotheses to be tested are the following:

Farmers with better access to information are likely to participate in the market, other things the same. The more information farmers have about the market, the more they will participate in the market:

- Extension contact makes farmers aware of possible market outlets for their products. As such, farmers with better contacts have a better chance of participating in the markets. This doesn't necessarily lead to higher levels of participation.

- Education allows farmers to interpret information about the market. So, farmers with better education are more likely to participate in the market. The opposite is also true; the lower the education level the less the market participation.

- Proximity to markets allows farmers to contact potential markets for information about the market conditions. Even when farmers are busy selling, proximity allows them to present the products to the market in

time at lower costs. As such, the proximity to market centres is negatively related to market participation.

- Good road conditions to the markets make it possible for farmers to market the products cheaply. Those farmers facing good road conditions tend to participate more in the markets than those who face poor road conditions do.

Farmers with more assets (or increased wealth) are likely to participate more in the market, other things the same:

- The size of the farm (land) used for production is positively related to market participation. When farmers have more land their production will be higher, thus making it sufficient for market participation since the per unit transaction costs will be lower due to the economies of scale. The more the farmer can produce the more will be marketed.

- Ownership of vehicles will increase market participation. This allows farmers to access information about the market and be in a position to deliver products.

- Farmers owning more livestock will participate more in markets. Livestock ownership tends to serve as a security for risk of market failure on the one hand, and contributing to productive assets on the other hand.

- Access to liquid assets, such as non-farm and pension earnings allows farmers to invest in marketing activities. Access to non-farm income and pensions will lead to more market participation.

The higher the risk or uncertainty farmers face, the less likely they will participate in agricultural markets. The risk attitude of farmers emanates from the structure of the household:

- Households headed by females are less likely to participate in the market. This leads to higher transaction costs since women are regarded as lacking credibility as contractual parties owing to the perception that courts (particularly tribal) will favour men in the event of a dispute with a woman.

- Age is positively associated with participation in agricultural market since older farmers may be more experienced in marketing management and tend to have stronger networks and more credibility, thus facing lower transaction costs. This relationship is expected to be stronger than the alternative hypothesis that younger farmers are less risk averse.

- The size of the household is negatively related to participating in the market. Normally, household members are both production and consumption units. When there are fewer opportunities to contribute productively, household units will be more of consumption unit, as is the case in the developing areas of South Africa. That is, larger households have more mouths to feed and therefore less to sell.

1.5 ANALYTICAL METHODS

The study employs two analytical methods to test the above-mentioned hypothesis:

Firstly, descriptive statistics is applied to the basic characteristics of the sample households in order to assess the difference in the household participation. This employs both frequency and means to describe the households.

Secondly, selectivity models are applied to identify and test significant factors of market participation. The selectivity models involve two-step estimation

similar to the Heckman's two-stage procedure. Firstly, probit models are estimated to determine the factors affecting decision to participate. Then, heckits (OLS accounting for selectivity bias) are estimated in the second stage to estimate the significant factors contributing to the level of participation. The two-step selectivity procedure is similar to the tobit model decomposing the probability to participate and the level of participation - hence tobit models are also estimated to validate the selectivity models.

The analysis is based on the information collected in the Northern Province. The subsequent sections overview the salient features of the Northern Province from which the study sites were selected. The procedures for selecting sampled households will also be discussed, which is followed by a discussion of the agricultural setting of the study area.

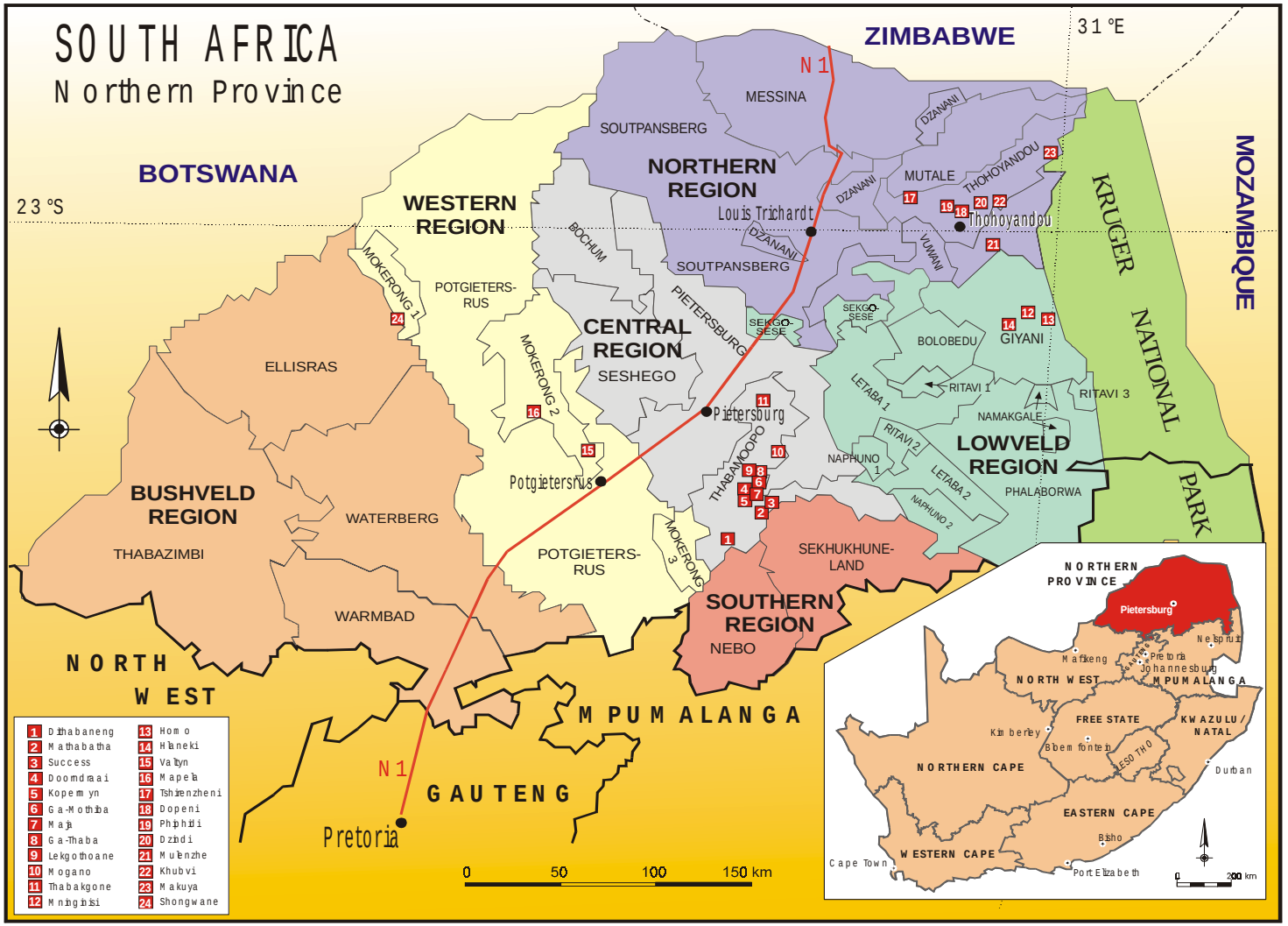
1.6 THE STUDY AREA

1.6.1 Overview of the Northern Province

1.6.1.1 Background of the province

The Northern Province is situated in the far northern part of South Africa, which is, interestingly, situated in the far southern part of Africa. The Province is adjacent to the Northwest Province, Gauteng and Mpumalanga and shares borders with Botswana, Zimbabwe and Mozambique (Map 1). The Northern Province covers 9,6 % of South Africa's total area, amounting to 116 824 km². This subsection and subsequent subsections in the section are based on NPDA (1996) and DBSA (1998).

The Province is divided into six regions: viz. Northern Region, Lowveld Region, Central Region, Southern Region, Western Region and Bushveld. The regions are further divided into sub-regions and/or districts.



MAP 1. THE DISTRICTS AND SITES IN THE STUDY AREA

The Northern Province can also be divided into several topographic zones. In the east there is a flat to gently undulating Lowveld plain, at an altitude of 300 to 600 m, bounded in the west by the northern Drakensberg escarpment and Soutpansberg, with steep slopes and peaks up to 2 000m above sea level. The almost level Springbok flats in the south lie at an altitude of 900 m, while the Waterberg and Blouberg to the north, with undulating to very steep terrain, reach 2 000 m. The north-west zone is a flat to undulating plain, which slopes down to the north and west, at 800 to 1 000 m.

The province falls in the summer rainfall region. The Lowveld region is hot and dry, with no frost and an average rainfall of less than 500 mm per annum. The mountains are cooler and wetter, with rainfall of 1500 mm or more in places. To the west, the rainfall varies from 600 mm on the Springbok flats to less than 400 mm on the Botswana border, where it can be extremely hot in summer. Dryland cultivation can only be practised on the Springbok flats and on the eastern escarpment and its foothills.

The major rivers are the Limpopo in the north, and the Olifants and Letaba further south, all of which drain eastward. The Limpopo only flows strongly occasionally, while the Olifants and Letaba are heavily utilised for irrigation, especially east of the escarpment. Most part of the province is very dry. Drought is an ever-present threat in the north, and a growing human population places considerable pressure on the existing resources especially in the Letaba catchment area.

Black and red fertile clay soils occur on the Springbok flats, with reddish-brown sandy loams to the north and west. The mountains have deeper, highly leached red soils in the wetter areas, with exposed rock where the climate gets drier. Reddish-brown, gravelly soils, which have low fertility, predominate in the Lowveld, with the best agricultural soils being alluvial soils next to most of the rivers. The Province does not have much high potential agricultural soil.

Of the estimated total of 12 million hectares, 67% (8 million ha) is utilised as agricultural land. Of these 8 million hectares of farmland, nearly 10% (0.8 million ha) is utilised as arable land, 67% (5.4 million ha) as natural grazing, 18.4% (1.5 million ha) for nature conservation, 1.1% (0.088 million ha) for forestry and 2% (0.16 million ha) for other purposes. About 76% of arable land (0.61 million ha) is allocated to dryland cultivation and forms the most important kind of cultivation occurring in the Northern Province.

In 1995 about five million people resided in the Province, making it the fourth largest province, with approximately 13% of the country's total population (DBSA, 1998). Of the five million people, 90.8% resided in rural areas, thus the rural inhabitants of the Province made up 22% of the country's total rural population. In 1995 the Province had an annual population growth rate of 3 to 4%, and a population density of 38 persons per square kilometre. Of the 5.2 million people, 55% (2.86 million) were female. About 48% of the population were 15 years old or less. The Province had the lowest human development index of the country, namely 0.47.

1.6.1.2 The economic structure

The Northern Province contributed only 3.6% to the GGP in the RSA during 1994. The biggest contribution, 49% to the GGP in the Northern Province, during this period came from the tertiary sector: trade, transport, finance, community services, government and other producers. The primary sector, consisting of the agricultural and mining sectors, was the second biggest contributor to the GGP (with 32.7%). Of this, 32.7%, agriculture contributed with 9.6%.

Agriculture has grown by a mere 3.8% between 1980 and 1991. The low contribution to the GGP may be due to drought in the latter years of this period. Despite this, the agricultural sector had a reasonable growth performance index

(GPI), resulting in the Province topping the rest of the country with respect to GPI.

In 1993 the gross income from agriculture was R1414 million. Of this amount, 17.3% was from field crops, 46.2% million from horticultural products, and 37% from livestock. These statistics show the importance of horticultural and livestock products in the province.

The total expenditure on intermediate goods and services, i.e. those items used in production, was R865 million. Of this amount farm feed, maintenance and repairs, and fuel contributed with 22.3%, 15.8% and 15.7% respectively. When expenses are subtracted from gross income, the difference is the contribution of agriculture to the GDP (Gross Domestic Product) amounting to R558 million.

The real net income from agriculture in the Northern Province increased from R156 million in 1983 to R252 million in 1988, but declined rapidly in the period from 1991 to 1993 (NPDA, 1996). Thus, when other indirect farming expenses such as indirect taxes and depreciation are subtracted from the contribution to GDP, a net loss of R28 million from agriculture was realised in 1993.

The economically active population in the Northern Province was 1 215 508 in 1994 (DBSA, 1998). The contribution to employment by the agricultural sector in this Province is 20.1%. According to the expanded definition of unemployment, the Northern Province has at present an unemployment rate of 47%.

1.6.1.3 Farming enterprises

The main farming enterprises in the Northern Province focus on the production of vegetables (NPDA, 1996). Within the Province the production of vegetables contributes an average of about 22% to the gross income from agriculture. On average the production of vegetables contributed approximately 18% to the total

gross income from vegetable production in South Africa. From the composition of horticultural products in the Northern Province, it is clear that the production of vegetables is the most important (49.1%), followed by citrus fruit (25.9%) and subtropical fruit (17.5%).

The production of nuts forms a small part of the gross income from agriculture in the Northern Province, yet it makes up about 43% of the gross income from nuts in South Africa. The production of citrus and subtropical fruit in the Northern Province contributes about 64% to the gross income from citrus and subtropical fruit in South Africa.

Animal products are the second largest generators of gross income from agriculture within the Northern Province (NPDA, 1996). The main animal products produced in the Province are beef, poultry, fresh milk and dairy products, and pork. From the composition of animal production, beef (53.6%) is the most important, followed by poultry (22.2%), fresh milk and dairy products (11.8%) and pork (7.9%).

The contribution of field crops to the gross income from agriculture in the Northern Province is relatively small. On average, for 1983, 1988, 1991 and 1993, field crops contributed 22.7% to the gross agricultural income of the Province. Cotton only contributed 5.9%, tobacco 4.7% and maize 4% to the gross agricultural income. The composition of field crops produced in this Province is cotton (24.3%), tobacco (21.1%), maize (17.4%) and sunflower seed (10.7%). On average the production of cotton in the Northern Province contributed more or less 56% to the total gross income of cotton produced in South Africa, sisal 51%, cowpeas 38% and tobacco 22%. Important field crops for smallholder sector are maize, grain sorghum and beans.

The Pietersburg Fresh Produce Market was declared a national fresh produce market in May 1995. The activities of the market have generally been small,

compared with other national fresh produce markets in the country. As of the end of 2000 only two market agents, namely the National Potato Association and the Northern Transvaal Cooperative, operated on this market. There are at least 260 other formal marketing outlets in the Province. Seventeen of these are grain and oil grinding mills, 13 processors, 12 abattoirs, some eight canners and preservers, 24 suppliers and distributors, 154 meat markets, 19 dairies and 13 fruit and vegetable markets.

1.6.2 Selection of study sites

For the purpose of the research the Northern Province was divided into five regions in 1997 when the survey was conducted: the Northern Region, Lowveld Region, Central Region, Southern Region and the Western/Bushveld Region. The reason for stratification is that the regions emerged from different administrations (of the former Lebowa, Venda, Gazankulu and central RSA), which provided different support services to farmers, and thus might lead to different transaction costs. All five regions were selected. Within each region one district was randomly selected by picking from a shuffled pile of district names in the region. An average of five sites was to be selected from each district, with an additional site. In two districts (in the Southern and Northern Region) all six sites were visited. In other regions the five sites were regrouped to as few as three sites (Map 1). Table 1.1 shows the distribution of sites and the respondents by regions.

Table 1.1: Distribution of research sites and respondents

Region	No of sites	Respondents	Group discussions
Northern	6	24	4
Lowveld	3	18	2
Central	4	29	4
Southern	6	57	2
Western/ Bushveld	3	29	3
Total	22	157	15

The Northern Region consists mainly of districts of the former Venda homeland areas (which include Dzanani, Malamulele, Mutale, Thohoyandou and Vuwani), some patches of the former Gazankulu homeland (mainly Malamulele area), former Lebowa (most of the Bochum area), and also former RSA areas such as Messina and Soutpansberg. The region has predominantly good agricultural land due to relatively high rainfall. The main town, Thohoyandou, is located in the Thohoyandou district. Accordingly, this district was randomly selected. Six research sites were randomly selected from a list of ward names provided by the extension service. From each ward a list of farmers was drawn, thus a total of twenty-four respondents were selected and interviewed. The information from household interviews was followed up by group discussions that elaborated on pertinent issues raised during the face-to-face interview. Four group discussions were conducted in the Northern Region.

The Lowveld region comprises mainly the former Gazankulu districts (such as Giyani, Hlanganani, Lulekani and Ritavi), some districts of the former Lebowa (mainly Naphuno, Bolobedu, Namakgale and Sekgosese), as well as the areas of the former RSA (Letaba and Phalaborwa). The lowveld areas of the region are mainly horticulture (fruit) production areas. For the purpose of the study, the Giyani district was selected. The Giyani district produces a range of agricultural products. The district is also the locus of the regional offices of former Gazankulu, located in the town of Giyani. The research sites selected were Hlaneki, Homo, and Mninginisi. About 18 households were interviewed from these three sites. Only two group discussions were conducted.

The Central region comprises predominantly the former Lebowa districts of Mankweng, Sekgosese, Seshego, and Bochum) and the Pietersburg districts of the former RSA. Pietersburg serves as the capital city of the Province. The Mankweng district was selected randomly from other districts. Although the northern areas of the central region are livestock producing areas, by contrast Mankweng district, lying south east of Pietersburg, is a predominantly maize

producing area. The research sites included GaMamabolo, GaMolepo, GaThaba, as well as Koppermyne (or GaMaja and GaMothiba). About 29 respondents were interviewed in four sites.

The Southern Region comprises areas of the former Lebowa districts Sekhukhune, Nebo, and Thabamoopo. This region, located south of Pietersburg is mainly arable with relatively low livestock production. The Thabamoopo district was selected for the survey. Two sites were selected, namely GaMathabatha and Dithabaneng. The former site is situated in a mountainous area with sufficient water, while the latter is dry. The latter site is located close to Lebowakgomo, the regional offices of the Southern region. About 58 respondents were interviewed. Two focus groups were involved.

Finally, the Western region mainly comprises the former Lebowa districts of Mokerong (or Mahwelereng), Zebediela and Phalala, as well as the former RSA areas of Potgietersrus, Ellisras, Thabazimbi, Warmbaths, and Waterberg. Mahwelereng is close to Potgietersrus, while Phalala is closer to Ellisras. The sites were picked from both Mahwelereng and Phalala. The motive was that there was still no clarity as to whether Phalala would fall under the then proposed Bushveld region. The Bushveld is an area further west in the Province, with the major towns Naboomspruit, Nylspruit, Warmbaths and Thabazimbi. It comprises predominantly the former RSA areas. The Western region is relatively dry, although farmers focus on maize production in Mahwelereng, and livestock in the Phalala area.

1.6.3 Agricultural setting of the study sites

Agricultural production in the Northern Province is diverse. This is reflected by the diverse agricultural production systems in the study areas. A majority of households (almost 70%) across the regions tend to focus on the production of field crops, dominated by maize in area planted and level of production. A typical

sample household would plant 1.56 ha of maize, which covers 50% of the arable area. Only 26% of the households produce maize under irrigation. This applies to some households in Mathabatha area in the Southern Region as well as to Mapela in the Western region. Maize in the Central Region, the Lowveld Region and the Northern Region is grown under dryland conditions. These areas tend to have reasonable level of rainfall.

Other field crops are also grown in the area, though not on such a wide scale as maize. They include grain sorghum, millet, beans and watermelons grown under dryland conditions. Generally these are grown as a mixed-cropped system. In such cases, planting methods are mainly through broadcasting during ploughing (which is normally done by contractors). Other field crops such as wheat are grown in selected irrigation projects such as in Mathabatha and Mapela.

In some instances farmers would farm a plot in a project setting, while growing other field crops on individual plots. Monocropping or intercropping is emphasised in project settings, while mixed cropping is practised mostly on individual plots. Government extension officers guide the projects by recommending the best practices. Their advice centres on practices such as planting time and application of recommended types of fertilisers and seeds. In the projects fertilisers and seeds are normally bought from co-operatives, or supplied directly by agents. Farmers in the projects are expected to follow certain production programs to harmonise the provision of inputs and service, with output marketing.

Some households in the study area are also involved in horticultural production. Less than 1% of households surveyed grow subtropical fruits such as bananas. These households are mainly in the Lowveld region, in particular at the Homo irrigation scheme. Vegetables are grown across the regions, though by relatively few households. Most of vegetables grown in the study area are cabbages, spinach, tomatoes, potatoes etc. Horticultural crops are grown under irrigation.

Livestock production is prevalent in the Northern Province. The incidence of higher livestock production, however, increases towards the north-western part of the Province. It follows that most of the livestock is found in the Western Region. The livestock categories include large-stock (mainly cattle), small-stock (mainly goats) and poultry. The livestock is kept in kraals at night and allowed to graze in communal camps during the day. Generally livestock is kept as precautionary assets, disposed off only when there is a need for cash. Local buyers provide a major market for small-stock, while large-stock is sometimes auctioned.

1.7 THE SURVEY AND DATA

1.7.1 Sampling procedure

As mentioned before, the procedure for sampling was stratified by region. All five regions were selected. 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. Sampling of households involved obtaining a sample frame of farmers from the extension office. Households were then randomly picked from the list. Where the list was not available before visiting the research site, farmers were convened, matched with the extension officer's register and randomly selected for interview. The heads of the households were interviewed. In the absence of the head (husband), the wife or the second member was interviewed. The main respondent would provide most of the information, but consulted with other household members where necessary.

1.7.2 Data collection

The information was collected in the Northern Province in 1997 following two-stages; face-to-face interviews with individual farmers, and group discussions with focus groups of farmers.

The face-to-face interviews were conducted with 157 randomly selected farmers. All respondents were requested to answer a set of structured questions. The respondents were given the opportunity to consult with other household members. The responses from the face-to-face interviews were reviewed, and based on this pertinent issues were identified.

These issues were then presented and discussed during a follow-up group discussion. The group consisted of a number of farmers who then elaborated on the issues. The groups were composed of farmers in the area; those who were interviewed and those who were not. They were convened through extension officers.

1.7.3 Variables collected

The instrument was designed to collect a range of information. This included information about household structure, consumption of food and non-food items, factors of production (land, labour, capital, human resource, natural resources, infrastructure, and management), as well as crop and livestock production.

Not all the information was usable for the study. For the purpose of the study the following information was utilised:

- Amounts of production sold at the market. This pertained to livestock, horticulture crops, maize and other field crops.

- Characteristics of the household regarding gender and age of the household head, as well as the size of the household. Other information

collected pertained to access to income and assets. This included non-farm income, pensions, arable land, and livestock as well as transport equipment. Information reflecting the farmer's access to market information was also collected in terms of average household education, contact with extension service and proximity to the nearest town where the markets are. The conditions of the roads to the markets were also determined.

1.8 CAVEATS

This study focuses on farmers in the Northern Province. These farmers are not necessarily representative of the total population of South African farmers. As such, generalisation of the results may not be possible without taking note of limitations.

The study also focuses on transaction costs as they affect smallholder farmers' decisions and level to participate in output markets. This focus might give the impression that transaction costs are the sole factors of market participation, while in fact they form part of a range of other factors affecting an entrepreneur.

1.9 ORGANISATION OF THE STUDY

The study is organised in six chapters. The second chapter discusses the literature review of smallholder market participation with respect to transaction costs. The third chapter presents a theoretical and empirical model (with estimation procedure) for analysing the effect of transaction costs in smallholder market participation. The descriptive characteristics of households in the study area are then presented in chapter four. The results of the model are presented in chapter five. Finally, the summary is presented and conclusions are drawn in chapter six.

CHAPTER TWO

SMALLHOLDER MARKET PARTICIPATION UNDER TRANSACTION COSTS

2.1 INTRODUCTION

This study is about market participation behaviour of small scale and resource poor farmers in South Africa. It endeavors to determine the factors influencing the decision of these farming households to participate in the output market for agricultural products, that is, the decision to sell or not to sell. In the context of this study, those factors that influence the decision to participate as well as the level of participation are commonly referred to as transaction costs. These costs are attributable to endogenous factors related to household characteristics and other factors, which are exogenous to the household.

The study applies the Transaction Cost Economics (TCE) paradigm, which is part of the NIE or New Institutional Economics (Hubbard, 1997; Clague, 1997; Poulton *et al*, 1998). The NIE has moved to the centre stage of economics during the last two decades, and, just as TCE, it builds on the 1937 article of Coase: “The nature of the firm”. This article postulates that economic activity does not occur in a frictionless environment, the main reason for this is the costs of carrying out the exchange (Benham and Benham, 1998). Williamson (1979, 1993, 1996) coined the phrase “new institutional economics” to distinguish it from the “old institutional economics” pioneered by Commons and Veblen (Paarlberg, 1993). The old institutional school argued that institutions were a key factor in explaining and influencing economic behaviour, but there was little analytical rigor and no theory in this school of thought. It operated outside neo-classical economics, and there was no quantitative theory from which reliable generalisations could be derived or sound policy choices could be made. Neo-classical economics, on the other hand, ignored the role of institutions. Economic agents were assumed to operate almost in a vacuum.

The NIE encompasses both paradigms, or, better put, it is a bridge between the two. It acknowledges the important role of institutions, but argues that one can analyze institutions within the framework of neoclassical economics. In other words, under the NIE, some of the assumptions of neo-classical economics (such as perfect information, zero transaction costs, full rationality) are relaxed but the assumption of self-seeking individuals attempting to maximize an objective function which is subject to constraints, still holds (Matthews, 1986).

The purpose of the New Institutional Economics is both to explain the operation of institutions and their evolution over time, and to evaluate their determinant impact on economic performance, efficiency, and distribution (Nabli & Nugent, 1989). There is a sort of two-way causality between institutions and economic growth. On the one hand, institutions have a profound influence on economic growth, and on the other hand, economic growth and development often result in a change in institutions. It must be said, however, that not all institutional changes are beneficial. In fact, by influencing transaction costs and coordination possibilities, institutions can either facilitate or retard economic growth. This explains, for example, why we have institutions that develop differently in different countries and why we have different paths of economic development.

The NIE represents thus an “expanded economics” that focuses on the choices people make, while at the same time it allows for factors such as pervasiveness of information and human limitations on the processing of information, evolution of norms, and willingness of people to form bonds of trust (Clague, 1997). As such this paradigm seems ideally suited to explain the commercialization behaviour of smallholders.

The objective of this chapter is to review studies that have applied the TCE paradigm to explain the economic behaviour of small-scale farmers and those poor in resources in developing countries. Although transaction costs in the context of Coase and Williamson are used to identify alternative modes of governance or economic organisation, i.e. spot markets, contracts and firms; the paradigm is also well suited to evaluate the organisation of individual transactions. To clarify this

distinction the chapter starts with a brief review of the TCE paradigm and then discusses the various theoretical and empirical applications pertaining to the commercialisation problems of small-scale farmers in developing countries.

2.2 TRANSACTION COST ECONOMICS (TCE)

2.2.1 An overview

The general hypothesis of the TCE paradigm is that institutions are transaction cost-minimising arrangements, which may change and evolve with changes in the nature and sources of transaction costs. This work was pioneered by Coase. In his seminal article "The Nature of the Firm" (1937) Coase argued that market exchange is not without costs. He recognised the role of transaction costs in the organisation of firms, and other contracts. Transaction costs include the costs of information, negotiation, monitoring, co-ordination, and enforcement of contracts. He explains that firms emerge to economise on the transaction costs of market exchange and that the "boundary" of a firm or the extent of vertical integration will depend on the magnitude of the transaction costs. However, Fourie (1989) argues that the existence of the firm cannot be explained by transaction cost argument *per se*, but decisions to integrate and the extent of the integration can.

The work of Williamson (1979, 1993, 1996) on the economics of organization and contracts follows on from Coase's line of thinking. Williamson combines the concepts of bounded rationality and opportunistic behaviour to explain contractual choice and the ownership structure of firms. Opportunistic behaviour manifests itself as adverse selection, moral hazard, cheating, shirking, and other forms of strategic behaviour. In Williamson's framework, a trade-off has to be made between the costs of co-ordination and hierarchy within an organisation, and the costs of transacting and forming contracts in the market (Drugger, 1983). This trade-off will depend on the magnitude of the transaction costs.

In North's view (2000), institutions that evolve to reduce transaction costs are crucial to the performance of economies (Hirsch and Lounsbury, 1996). North sees the role

of the government as crucial in specifying property rights and enforcing contracts, both of which promote specialization and reduce the costs of market exchange. In other words, the inability of societies to develop effective, low-cost enforcement of contracts is an important source of stagnation and contemporary underdevelopment in the developing countries (*cf.* North, 2000).

Transaction Cost Economics is especially relevant for agricultural market analysis in developing countries because many of the institutions, or formal rules of behaviour, that are taken for granted in developed countries which facilitate market exchange are absent in low-income countries. The frequent occurrence of market failure and incomplete markets (i.e. caused by higher transaction costs and information asymmetries) in developing countries cannot be explained by conventional neo-classical economics and requires an institutional analysis. Therefore, the NIE and specifically TCE could help to determine what types of institutions are needed (either formal or informal) to improve the economic performance in developing countries.

2.2.2 The concept of transaction costs

The enforcement and the exchange of property rights typically involve costs. These are referred to as transaction costs. Eggertson (1990:15) defines transaction costs as "the costs that arise when individuals exchange ownership rights for economic assets and enforce their exclusive rights". In terms of the context of this study, only the transaction costs arising for individual agents or for basic economic units such as households are considered. This type of transaction costs includes expenses and opportunity costs, both fixed and variable, arising from the exchange of property rights. Transaction costs originate typically from the following activities (see Eggertson, 1990: 15):

- the search for **information** about potential contracting parties and the price and quality of the resources in which they have property rights (this includes personal time, travel expenses and communication costs),

- the **bargaining** that is needed to find the true position of contracting parties, especially when prices (incl. wages, interest rates, etc.) are *not* determined *exogenously*,
- the **making of (formal or informal) contracts**, that is, defining the obligations of the contracting parties,
- the **monitoring** of contractual partners to see whether they abide by the terms of the contract, and
- the **enforcement** of the contract and the **collection of damages** when partners fail to observe their contractual obligations.

Jaffee and Morton (1995) add a further two dimensions of transaction costs in the context of marketing agricultural produce:

- **Screening costs**: These refer to the uncertainty about the reliability of potential suppliers or buyers and the uncertainty about the actual quality of the goods,
- **transfer costs**: These refer to the legal, extra legal or physical constraints on the movement and transfer of goods. This dimension commonly includes handling storage costs, transport costs, etc.

Many systems are used to classify or refine the concept of transaction costs but generally transaction costs have been defined as the cost of information and/or cost of facilitating a transaction as outlined above. Another approach is to refer to transaction costs as perceived risk, transportation, and administrative costs (Drabenstott, 1995). In other cases the transaction costs were classified into observable and unobservable or inhibitive transaction costs (Staal, Delgado and Nicholson, 1997 and Delgado, 1995). The observable transaction costs include marketing costs such as transport, handling, packaging, storage, spoilage etc. (Delgado, 1995) and are observable when a transaction takes place. The unobservable transaction costs include cost of information search, bargaining, screening, monitoring, co-ordination, enforcement (Bardhan, 1994), and product differentiation (Benham *et al*, 1998). The latter are inhibitive and often cannot be

observed. According to Delgado (1997) these are costs of participating in the market process, whether or not a market exists. This study carried out in the context of the Northern Province endeavours to determine how unobservable transaction costs, amongst other factors, limit participation of small-scale farmers in the market economy.

Haddad and Zeller (1997) equated transaction costs with administrative costs of screening, delivery and the monitoring of implementing a program. This is conceptually similar to Hobbs (1997) who classified transaction costs into information, negotiation, and monitoring or enforcement costs. Information costs arise *ex ante* of an exchange and include the costs of obtaining price and product information and the cost of identifying a suitable partner. Negotiation costs are the costs of physically carrying out the transaction and may include commission costs, the costs of physically negotiating the terms of an exchange, and the costs of formally drawing up contracts. Monitoring or enforcement costs occur *ex post* a transaction and are the costs of ensuring that the terms of the transaction (quality standards and payment arrangements) are adhered to by the other parties involved in the transaction. The observable costs reflect explicit costs while unobservable costs are implicit (Cuevas and Graham, 1986).

In terms of transaction costs influencing modes of governance of firms and organisations Frank and Henderson (1992:941) argue that most of the influential transaction cost factors relate to uncertainty, input supplier concentration, asset specificity, and internalisation costs. This assertion is in line with Zaibet and Dunn (1998) who define transaction costs in terms of risk attitude of farmers. These authors differentiate between internal and external transaction costs. Frank Henderson (1992) determined the effect of transaction costs on vertical integration by grouping transaction inefficiencies into the categories 'uncertainty', 'concentration', 'idiosyncratic investments', and 'costs of administered vertical co-ordination'. For example, when transactions are conducted under uncertainty, it can become very costly or impossible to anticipate all contingencies (*ibid*). This view is, however, not relevant for this study.

Some of the costs are related to physical details of the transaction, such as transport, marketing, packaging or handling. Others result from information asymmetries and contract enforcement problems, which cause economic agents to incur expenditures associated with search, recruitment, co-ordination, supervision, management and litigation. The point is reiterated by Zaibet and Dunn (1998:833) who indicate that transaction costs include high transport costs due to the distance of the farm from the market, poor or non-existent infrastructure, high marketing margins due to monopoly power, and high costs of searching and monitoring contracts.

Hayes *et al* (undated) distinguish transaction costs in integrated agricultural markets from transaction costs in commodity markets. The former includes:

- The bureaucratic costs and distortions associated with managing and co-ordinating integrated production, processing and marketing.
- The value of time used to communicate with the participating farms and co-ordinate them.
- The costs of incentives employed to convince farmers to voluntarily participate in integrated production.
- The costs involved in establishing and monitoring long term contracts.
- The economies of scale forgone when batch production replaces commodity production

Transaction costs also result from information inefficiencies and institutional problems, such as the absence of formal markets. The presence of transaction costs is often reflected by the difference, or discrepancy, between perceived buying and selling prices (De Janvry *et al*, 1991). When these discrepancies occur, sellers experience low selling price and consequently might feel discouraged to sell, while buyers experiencing a high buying price, become discouraged to buy.

Thus, the market will fail when the cost of a transaction through market exchange creates a disutility greater than the utility gain that it produces. In other words, the

result is that the market is not used for the transaction (*ibid*; Fafchamps and Minten, 2001).

The other relevant delineation of transaction costs was used in Key *et al* (2000). They distinguish between fixed and proportional transaction costs. The fixed transaction costs are the same regardless of the level of transactions made. That is, the same costs are experienced once the decision to exchange has been made. For example, the information costs of finding the market will be the same regardless of whether the household sells more or less of a particular commodity. Once the information about the market has been obtained and contacts made with the buyer, a household can sell any amount without having to make extra efforts (or expend extra costs) for information about the same market. The fixed transaction costs are different from proportional transaction costs, which vary with the level of, or the amount involved in, the transaction. For example, the quantity of assets used to deliver products to the market will differ per amount of output marketed.

Development of formal models of TCE is still in an early stage. Some of the recent developments lean on the theory of incomplete contracts (Hendrikse and Veerman, 2001). The advantage of incomplete contract theory over transaction costs theory per se is that the behavioural assumption of opportunism is maintained in the analysis. Further, it sharpens the transaction costs argument by suggesting that the crucial difference between governance structures resides in the allocation of residual decision rights. However, the theory of incomplete contracts does not provide a formalisation of decision-making under transaction costs. The next section reviews theoretical frameworks for analysing transaction costs in smallholder farming.

2.3 TRANSACTION COSTS IN SMALLHOLDER FARMING

In their pioneering study, de Janvry *et al* (1991) examined the effect of “missing markets” using a household model calibrated to represent a generic African household. The study showed that in the absence of food markets households must be self-sufficient in terms of food, which confines their ability to reallocate land and labour to cash crops. Basically, these households tend to face wide margins

between low selling price and high buying price (Sadoulet and de Janvry, 1995). Transaction costs are used to explain why a market might be "missing", for example, in credit markets (Besley, 1994; Swaminathan, 1991), labour markets (Sen, 1966; Sen, 1981; Bardhan, 1984), land markets (Carter and Wiebe, 1990, Carter and Mesbah, 1993) as well as the product markets (Stiglitz, 1998; Holden and Biswanger, 1998). These market failures result in alternative institutional arrangements (Biswanger and Rosenzweig, 1986; Timmer, 1997; Delgado, 1999) such as sharecropping, interlinking and interlocking of markets (Bardhan, 1980; Clapp, 1988; Braverman and Stiglitz, 1982; Biswanger, Khandkar and Rosenzweig, 1993).

Transaction costs include costs resulting from distance from markets, poor infrastructure, high marketing margins, imperfect information, supervision and incentive costs (Sadoulet and de Janvry, 1995). This study aims to contribute to the understanding of the role of transaction costs in making one household more commercially oriented than another. It is hypothesised that transaction costs prevail in South Africa's developing areas as is reflected by the low market participation of small-scale farmers. The transaction costs emanate from a number of sources. In the first place, small-scale farmers are located in remote areas far away from service providers and major consumers of farm products. The distance to the market, together with the poor infrastructure, poor access to assets and information is manifested in high exchange costs.

In order to participate in the market, farmers must determine who it is that one wishes to deal with, what the terms are, they must conduct negotiations leading to a bargain, draw up a contract, and undertake the inspection needed to make sure that the terms of the contract are being observed (Hobbs, 1997; Coase, 1937). These operations are often sufficiently costly to prevent many transactions from taking place, which otherwise would have been carried out in a world in which the pricing system works without cost (Staal *et al*; 1997; Coase, 1937). Campbell (1978) illustrated the problem of transaction costs in market participation better: After deciding on a price, one needs to find a buyer. The longer one looks for ideal buyers, the higher the search costs incurred, which are part of transaction costs.

Transaction costs include, in addition to advertising, telephone and transport costs, also the actual time spent. These extra costs of search and information may rise so high that they exceed the gap between the price at which one would be willing to sell (buy) and the price asked (offered) by the end user.

Staal *et al* (1997) assert that the limited empirical evidence on the nature and importance of transaction costs is mainly caused by conceptual and measurement difficulties (see also Dorward, 1999). For example, when transaction costs are sufficiently high in order to prevent exchanges from occurring, then, by definition, these costs cannot be observed because no transaction took place. It follows that transaction costs of "observed" transactions are generally different from "prohibitive" transaction costs (Cuevas 1988a & 1988b).

A number of studies have attempted to address the question of transaction costs in market participation theoretically and empirically. Extensive work has been done in the area of finance (Zander, 1992; Cuevas and Graham, 1986; Saito and Villanueva, 1981; Cuevas, 1988, Fenwick, 1998). There is, however, a growing interest to understand how transaction costs affect participation in input as well as output markets.

To a greater extent these studies provided some understanding of the relationship between transaction costs and commercialisation. The high transaction costs in finance and input markets tend to reduce potential commercialisation. In addition, inhibiting transaction costs will inhibit a commercialisation process from taking place.

Williamson (cited in Frank and Henderson, 1992) argues that increases in transaction complexity, frequency, and uncertainty, accompanied by idiosyncratic investments, result in a shift in the co-ordination structure from classical to neo-classical to bilateral and, finally, to unilateral relational contracts. One party typically becomes dominant in this progression (*Ibid* 1992:942). That is, as transaction costs increase, marketing arrangements can either become less formalised, and/or farmers switch to other institutional arrangements if one of the parties involved in the transaction becomes dominating (Holden, 1997). In short, there are always some

transaction costs attached to any sale or purchase, but the greater the degree of organisation in the market, the smaller these transaction costs are likely to be and the easier it is to benefit from the exchange opportunity (Campbell, 1978).

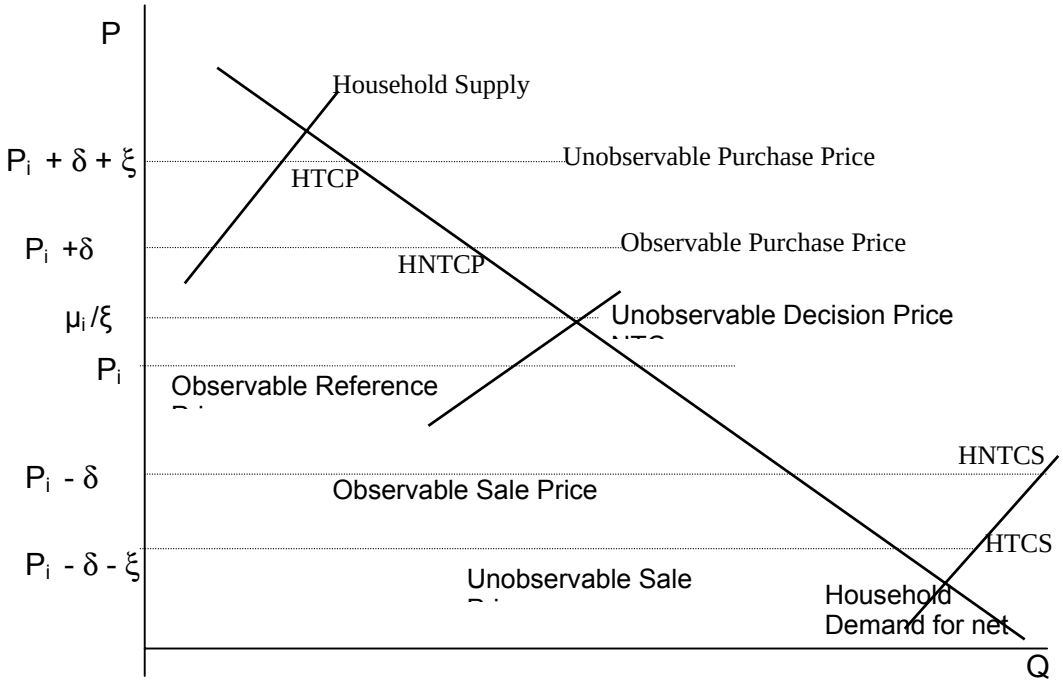
In many instances market participation declines as a result of inhibitive transaction costs. According to Staal *et al* (1997) a low proportion of products exchanged in the market reflects the existence of high transaction costs. Strasberg *et al* (1999) found that price and distance to a paved road (an indication of travel costs) both have a significant negative effect on fertiliser use, *ceteris paribus*. On the other hand, Zaibet and Dunn (1998) reflected on internal (endogenous) transaction costs, which involve intra-household factors such as the number of family members and the dependency ratio. These are likely to reduce market participation since capital embodied in market linkages is not individual specific but can be shared among immediate relatives (Goetz, 1992).

It is clear from the preceding review of literature that until recently there was no development of a conceptual framework of the TCE paradigm in smallholder agriculture. This lack was compounded by operational problems of empirical analysis since lack of participation implies that the transaction costs cannot be observed. The bottom line is that transaction costs tend to reduce the net benefits of exchange. When that happens, smallholder farmers will stop participation. Some theoretical perspectives, however, have been advanced recently, and are reviewed subsequently.

2.3.1 Theoretical foundation

The basic theoretical exposition of effects of transaction costs on participation in a competitive market have been proposed by Sadoulet and de Janvry (1995) and Delgado (1991), and Fafchamps, de Janvry and Sadoulet (1995). Fig 2.1 shows how observed transaction (marketing) costs and unobserved transaction costs affect household sales and purchases. The basis is that transaction costs affect price, which in turn affects traded output.

Fig 2.1: How observed transaction (marketing) costs (δ) and unobserved transaction costs (ξ) affect household sales and purchases



Adapted from: Sadoulet *et al* (1995), De Janvry *et al* (1991), Delgado (1991)

HTCS = sales by household facing high transactions costs
HNTCS = sales by household facing lower transaction cost
HTCP = purchases by household facing high transaction costs

The surplus-producing household, which sells produce (food), will receive an observed sales price of $P_i - \delta$, where δ represent the marketing costs. At that price the household will sell HNTCS, i.e. sales of a low transaction costs household. When the household faces more transaction costs (ξ), the unobserved decision price, $P_i - \delta - \xi$ will correspond to sales of HTCS, i.e. sales of a household facing higher transaction costs, which is less than the sales of HNTCS. So, the higher the transaction costs are, the less the households will sell. It is hypothesised that transaction costs are negatively related to market participation.

For deficit households which purchase food, the observed purchase price will be $P_i + \delta$, where δ is the observable (marketing) costs. At that price the household equilibrium conditions will be at HNTCP, that is, purchases by households facing low

transaction costs. However, if the household faces unobservable transaction costs (ξ), the decision price will be $P_i + \delta + \xi$, thus purchasing at HTCP or purchases of transaction costs facing household. Thus a household tends to purchase less when faced with high transaction costs as compared to when it is facing low or no transaction costs. It is therefore hypothesised that transaction costs are negatively related to market participation.

This framework provides insights in the possible behaviour of deficit and surplus producers when faced with transaction costs. It must be stated that the very existence of transaction costs leads to a lower number of observable transactions than would have been the case if there had not been any transaction costs. The hypothesis is that the hidden transaction costs will negatively affect commercialisation, or, in other words, reduce the potential for market participation.

The problem with this approach is that it is based on the strong assumption that only surplus producers will commercialise or sell their produce. That is, deficit producers will not be driven to participate in the market. Evidence from elsewhere, however, - in particular from Uganda - reflects that when conditions allow, households at different levels of production will commercialise (Ejupu *et al*, 1999). Similarly, the situation in South Africa is in line with the fact that a production level is a necessary but not a sufficient condition for commercialisation (Makhura, 1994). As such, the decision to commercialise is a decision related to the level of complexity of the household. This requires household models rather than a competitive market framework.

2.3.2 Household decision under transaction costs

Usually there is a range of factors affecting the behaviour of households in the decision making process with regards to market participation. Firstly, the risk or uncertainty of the outcome of participation may sometimes be a major source of transaction costs. However, their effect on transaction costs may not be as direct as

transport costs would be or other socio-economic factors that influence the participation decision.

2.3.2.1 Risk, uncertainty and transaction costs

Risk behaviour and market participation are interlinked (Ellis, 1993). On the one hand uncertainty is reduced by market participation, provided this is based on to improved information, communication, market outlets, and so on. On the other hand uncertainty is exacerbated by greater market participation, since the safety of subsistence is replaced by the insecurity of unstable markets and adverse price trends. There are two views of assessing risk in market participation (Dorward, 1999).

Firstly, risk enters market participation as an outcome of market conditions. Households will allocate their limited resources to subsistence and commercial production such that the disutility of risk is balanced against the utility of market goods (Von Braun *et al,* 1991). That is, since commercialisation is associated with risk, it can be assumed that the higher the risk the less commercially inclined the household will be. This view is useful in analysing the risk factor as an outcome of the commercialisation process. The link between risk and transaction costs, however, is not clear.

Secondly, risk and transaction costs are interlinked in market participation. Different factors affect the decision by small-scale farmers to participate in markets. Zaibet and Dunn (1998) developed a conceptual model considering only the uncertainty associated with commercialisation, very much like Von Braun *et al* (1991). Such uncertainty is represented by high transaction costs as a result of imperfect knowledge of the different participants in the market. The farmer needs to contract with other partners to sell output and purchase inputs. In the absence of formal institutions that regulate such transactions, the farmer has to face costs to obtain information about these different agents, to contract, to monitor, and to enforce the agreements. Such uncertainty is reflected in the utility maximisation problem of the household and can be likened to an individual‘s willingness to pay for participation in

the market and benefit from the transfers. In this context such efforts represent the value of assets spent to overcome the transaction costs. It is assumed that this amount is proportionally related to the volume of activities rendered on the market (Key *et al*, 2000).

The other kind of uncertainty in the view of Zaibet and Dunn (1998) is "social uncertainty" associated with collective decisions. Such uncertainties involve "internal" transaction costs, in contrast to the previously discussed "external" costs to the household. Internal transaction costs are not apparent but may represent a constraint to the decision-making process in extended households and may inhibit commercialisation. Zaibet and Dunn (1998) further suppose that there is a premium in a peasant's willingness to overcome these costs. Such premium is assumed to be proportionally related to the size of the household.

The importance of the framework arises from the analysis of strategic risk taking under risk aversion behaviour. According to Bromley and Chavas (1989) market participation "would be more likely to take place in situations where strategic uncertainty is relatively small". So, given identical probabilities concerning information available about the market, the individual with a lower risk premium will be less risk averse and more likely to participate in the market than the individual with a great risk premium. The hypothesis of internal transaction costs is that where the nuclear units are allowed ownership of assets (such as plots), the decision to hire labour or *sell output* would imply lower transaction costs than would be the case for an extended family. Consequently, transaction costs are hypothesised to be higher in the case of an extended family ownership system as a result of the higher monitoring costs in the larger family.

This approach clarifies the association of transaction costs with risk attitude. By implication risk variables are components, which can partly explain transaction costs. This view distinguishes between "internal" and "external" transaction costs and thus allows for consideration of both intra-household and inter-household factors. The most relevant factor, however, is the size of the household and its possible characteristics in processing information or overcoming transaction costs.

2.3.2.2 Transport costs as direct transaction costs

To show household decisions regarding consumption, production, purchases and sales of a particular crop, Omamo (1998) recognises that transaction costs will differ and depend on whether the household is a self-sufficient, a deficit or a surplus producer. The hypothesis is that high transaction costs will influence the commercialisation pattern of the household. This is caused by both the net buyers of staples, who will prefer to buy less by producing more themselves, and the sellers of cash crops, who will prefer to sell more and produce less for own consumption.

The limitation of Omamo's approach is that it only considers observable transaction costs incurred by transport. Again, it must be emphasised that the observable transaction costs are only realised when the household participates in the market, and will thus only affect the magnitude of commercialisation. Looking at the South African situation this is, therefore, not really appropriate, for here the concern is to alleviate constraints, which inhibit, and sometimes even prohibit, participation in markets. Omamo's model does not incorporate unobservable transaction costs, thus this model has limited use with respect to its applicability to South Africa.

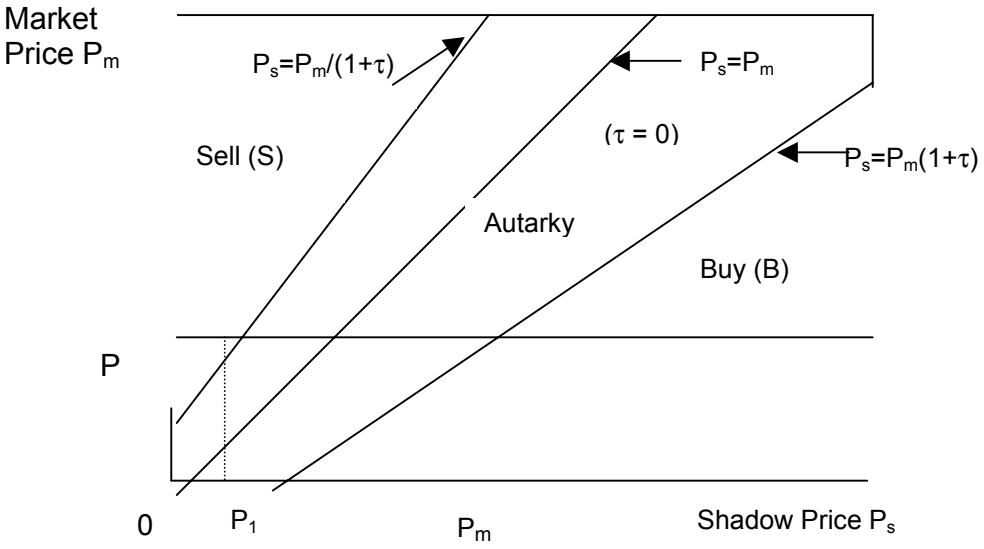
2.3.2.3 Fixed transaction costs, buying and selling price gap

It is possible, though, to modify the framework proposed by Omamo so that it models situations where households make trichotomous decisions on buying, or selling, and/or not participating at all in the market. The selectivity model of household food marketing behaviour is proposed by Goetz (1992) following the formulation by Strauss (1984). Goetz makes the proposition that failure to participate in specific commodity markets results from high fixed transaction costs. Furthermore, he asserts that factors affecting the amount to buy or sell are the same as those affecting the decision of whether to participate in the market as a buyer or seller. The opposite is not true.

Goetz proceeds to illustrate the relationship graphically by showing the market price of food paid or received by a household participating in cash markets (vertical axis in fig 2.2). The horizontal axis shows the value (price) of food to the household. If there are no fixed transaction costs (τ), the household equates its shadow price with the market price. Thus, we can infer from this that market participation behaviour is continuous (as opposed to discrete, or subject to a threshold) as the price varies (Goetz, 1992; Makhura *et al*, 1996).

Fixed transaction costs may prohibit households from participation in the market (Goetz, 1992; Key *et al*, 2000). This leads to the proposition that: *Failure to participate in specific commodity markets results from high fixed transaction costs* (Goetz, 1992). In principle, variables affecting the amount to buy or sell are the same as those affecting the decision whether to participate in the market as a buyer or seller. The opposite is not true, however: There are fixed cost-type variables affecting participation decisions, but they do not affect the extent of participation since this depends on the labour-leisure choice *(ibid, 1992).*

Fig 2.2: Market participation behaviour of households



Source: Goetz (1992)

2.4 EMPIRICAL STUDIES ON TRANSACTION COSTS

Relatively few studies have undertaken empirical work to determine the effect of transaction costs on market participation by farmers. This section reviews some empirical studies analysing transaction costs in agriculture. It gives an overview of their role in output markets, input markets, and how they are constructed. The section closes with some studies focusing on South Africa.

2.4.1 Transaction costs in output markets

A number of studies have presented the effect of various factors on agricultural output markets. Only a few studies have discussed the effect of transaction costs on output markets (Goetz, 1992; Omamo, 1998; Key *et al*, 2000; and Gabre-Madhin, 2000). A growing interest is shown in transaction costs in milk marketing (Staal *et al*, 1997; Holloway *et al,* 2000; and Staal *et al*, 2000).

In his study of household food marketing behaviour, Goetz (1992) used a range of factors to reflect the effect of transaction cost factors on the market participation in course grain, both for buying and selling. The factors included proxy variables for fixed transaction costs, which included ownership of carts for transportation of grain to the market, physical distance from the market, and regional dummy variables. Ownership of assets is considered important in reflecting market access. The study found a significant relationship between the grain price and the probability of buying, and the quantities bought and sold. The results further showed that apart from these there are other factors, unrelated to the relative changes in output price, which stimulate market participation. Better information, for example, significantly raises the probability of market participation for potential selling households, while access to coarse grain processing technology raises quantities sold by sellers, that is provided they participate in the market.

Key *et al* (2000) extended Goetz's analysis by focusing on participation in maize markets in Mexico. Their study found that both fixed and proportional transaction costs play a significant role in explaining household behaviour. With respect to this the proportional transaction costs played a more significant role in the selling rather than the buying decisions. Specifically, selling to official sources tended to significantly increase the production and selling threshold for the sellers. At the same time, the ownership of a pick-up truck, for example, is associated with a lower production-selling threshold. This implies that ownership of assets tends to reduce entry barriers into the market.

A similar study was conducted by Holloway *et al* (2000). Their study sought to identify alternative techniques for effecting participation among peri-urban milk producers in the Ethiopian highlands. The study concludes that institutional innovations to promote entry into the market should be accompanied by a mix of other factors such as improvements in infrastructure, knowledge, and asset accumulation in the household. Furthermore they found that by locating

producers, the time required to market milk could be minimised. This increased the number of participating producers and the level of marketable surplus. The results somehow confirmed Staal *et al*'s major finding (1997), which emphasises that transaction costs increase with distance, most likely faster than could be expected from mere transportation costs. This is caused by the increased costs of information, and risk of wastage or spoilage when a buyer is not found in good time. Staal *et al* (2000) further discusses the spatial aspects of producer milk price formation in Kenya. In their study the GIS-derived variables for distance and transport costs are combined with survey-derived variables for household characteristics to model market participation and the formation of farm-level milk prices. Their results differentiate between the effects of roads by type and distance, and highlight the importance of milk production density and market infrastructure.

Omamo (1998) used the transaction costs approach to determine households' decisions to rather devote resources to low-yielding food crops than to cash crops with higher market returns in the Siaya district in Kenya. The analytical results and simulations used indicate that transport costs matter and are sufficient to explain the cropping choices in a deterministic setting. The results imply a particular spatial configuration of the production pattern, in that relatively more land is devoted to cash crops and less to food crops the closer the households are to markets. Fafchamps (1992) in his study of cash crop production found similar results when he looked at food price volatility and rural market integration. The study found that whereas better roads and transportation tended to equalise price movements across a larger regional and even international market, the food prices become increasingly dissociated from local supply and demand conditions. Further, Minot (1999) also found that transaction costs (particularly transportation costs) not only decrease market surplus but that they can substantially reduce the elasticity of supply and demand.

The use of the transaction costs approach to inform action is not limited to crop choice, but has been empirically applied in the choice of livestock marketing channels (Hobbs, 1997). The study revealed that some transaction costs variables (such as grade uncertainty, risk of not selling, time spent at the auction) were a significant factor affecting the choice of either live-ring auction direct-to-packer sales. A similar study by Mathye *et al* (2000) addresses the choice of marketing channels for smallholder farmers producing bananas and mangoes in some areas of the Northern Province and found that not all farmers sell their product. Those who do sell tend to use different channels such as a fresh produce market, an achaar market and direct sales to consumers. Different factors affect the choice of the market channel, but the study found that problems of transport, searching for markets and education tend to influence participation.

Gabre-Madhin (1999) addressed another side of the output markets by focusing on the transaction costs in the choice of market institutions such as grain brokers in Ethiopia. In this case traders first choose where to trade and then choose whether to use a broker to search on their behalf. The study found that high transaction costs shown by traders' individual rationality in selecting brokerage is linked to increased broker use, while high social capital reduces the use of brokers. Social capital or networks play an important role in the resolution of dispute among traders, that is, trust-based relationships are the dominant contract enforcement mechanism among traders (Fafchamps and Minten, 2001). Fafchamps and Minten measured social capital in terms of the number of relatives in agricultural trade, the number of traders known, the number of people who can assist, the number of suppliers known personally, as well as the number of clients known personally. Using the value of annual losses due to theft as a proportion of annual sales, their study sought to analyze property rights in the Malagasy flea market. They found that the incidence of breach of contract is low, and losses resulting from such instances are small. Traders preferred to depend on trust-based relationships for contract enforcement, rather than rely on formal legal institutions such as the police and courts. Ostensibly, the costs of involving

the justice system are more problematic for grain traders than legal risk and delays are.

In their study on investments, governance structures, and prices in evolving markets, Beckmann and Boger (undated) use case studies of hog transactions in Poland to determine factors influencing the contracts used. These studies also show distinctions between different groups in production behaviour. Following the TCE, the results show four groups with similar marketing behaviour. The first group did not invest significantly, traded on spot markets and received a relatively low price. The second and third showed significant investments, and secured their investments either through neo-classical or relational contracts and received significantly higher prices. However, the fourth group of hog farmers with high, focused investments in production did not receive higher prices and did not obtain a safeguard of their investment through contracts.

2.4.2 Transaction costs in input markets

Most of the early empirical evidence of transaction costs involved credit provision. For example, Ahmed (1989) compared transaction costs of borrowing from formal and informal sources in rural Bangladesh. The study found that transaction costs resulting from loans from formal lenders are higher than those of loans from informal lenders are. He further concluded that transaction costs per unit of loan decrease with loan size, and also that this was much faster for formal than for informal loans. These conclusions are in line with Saito *et al*'s (1981) findings that rural banks tend to have much lower administrative costs since many of them are owned and managed by those who were originally the local moneylenders. This leads to the conclusion that the relatively low transaction costs of the rural banks' lending operations clearly indicate that this kind of institutionalisation of the informal sector is an appropriate way of extending credit to the small-scale sector.

Other studies in finance focus on the transaction costs for the borrower (Zander, 1992). According to Gunawardena (cited in Zander 1992) used travelling costs,

opportunity costs of labour, interest payments and other expenses as components of transaction costs. He found the rather puzzling result that the transaction costs for borrowers from formal banks were considerably lower than for customers of moneylenders and traders. In contrast with this, Herath (1989, cited in Zander, 1992) found that loans are advanced by informal sources at a proportion of the transaction costs of formal lending. Zander (1992) carried out a comparative analysis, which suggested that the distance between households and financial intermediaries did not influence the borrowers' decision for or against certain lenders. Instead, other factors, such as the nature of collateral, loan amount and the speed of transaction tended to be influential.

Other substantial work in the area of credit market is due to Cuevas (1988a, 1988b), and Cuevas and Graham (1986). They set out to investigate the role of transaction costs attached to borrowing as a rationing mechanism in agricultural credit markets in developing countries. The results suggest that the loan amount, interest rate, and loan source are significant determinants of the level of transaction costs. Transaction costs as a percentage of the loan amount tended to decrease with loan size, and decline with increases in interest rate. They are higher for private bank loans than for development bank loans. It is clear that the transaction costs of borrowing play an important role as implicit factors in determining prices in rural credit markets.

Other studies considered other input markets such as the use of fertiliser (Strasberg *et al*, 1999; Zaibet and Dunn, 1998), mechanisation, and labour (Zaibet and Dunn, 1998). Zaibet and Dunn used size and ownership of land, regional location, number of plots, and existence of annual crops as proxies for transaction costs. The study was set up to test the proposition that larger family ownership systems, as opposed to restricted family ownership systems, and farm size are sources of increased risk aversion and transaction costs, and factors in market participation. Only in the case of the fertilisers it was found that the nuclear family ownership system was found to have a significant and positive correlation with fertiliser purchasing. In the case of mechanisation and labour hiring, the estimate of ownership was positive but not significantly different from zero. A large farm size was found to be significantly and

positively correlating to mechanisation and labour use. According to Strasberg *et al* (1999) the use of fertiliser nutrients depended mainly on the distance to a motorable road, assets such as the value of agricultural equipment owned, value of the livestock owned, and human resource factors.

The transaction costs are also prevalent in input markets, whether the focus is on capital (credit), mechanisation or fertiliser, land or labour. Generally ownership of assets tends to influence the participation in such markets.

2.4.3 Transaction cost factors

There are two approaches to studying transaction costs (Hirsch *et al,* 1996): either as explanatory factors to explain certain behaviour (according to Williamson), or as a response variable affected by a range of factors (according to North). The latter is discussed in the subsequent paragraphs.

Since transaction costs are sometimes unobservable, several authors use household characteristics to measure their contribution to transaction costs. A number of empirical results have emanated reflecting the process of capturing these costs. This is applicable since market failure is household-specific (de Janvry *et al*, 1991; Goetz, 1992) as well as commodity specific (Delgado, 1999; Grosh, 1994; and Key *et al*, 1999).

A major element of transaction costs relates to *market information.* These are costs associated with lack or access to sources of market information. It has been found in Abdulai and Delgado (1999) that the decline in the cost of information and transport flows as a result of a good infrastructure reduces transaction costs. Strasberg *et al* (1999) found that increased human capital has significant positive effects on the effective use of inputs since the chances are that better management skills are available, and thus there is a greater propensity to seek information on operations of the market.

The access to information has been viewed in different ways in the literature. For example, Makhura (1994) defined access to information amongst others as having the opportunity of listening to the radio for agricultural information. The study found that access and use of such information differentiated between farmers selling more agricultural produce from those who are selling little. He and Yang (1999) found that farmers in some regions of China obtained their market information a) from neighbours or friends (31%), b) from TV, newspaper or magazine (20%), and c) through carrying out investigations on markets (13%). In all these cases the transaction costs were lowered as a result. The study by He *et al* (1991) posed that the actual costs of accessing such information were generally very low. These farmers did have high transaction costs caused by a small transaction scale, outdated information, and a disorderly marketing system.

2.4.4 Previous studies in South Africa

The application of TCE in South African research into agriculture has not really taken off. So far only few studies have addressed the issue of transaction costs directly. Perhaps the one study that attempted to provide a measure of transaction costs was advanced by Fenwick (1998) and Fenwick and Lyne (1998) who computed a transaction costs index from variables reflecting gender and education of the head of the household, length of residency, migrant workers, district dummy as well as ownership of a car. The index is computed as the standardised values of each variable in the index as the sum of gender and education, plus length of residency and the log of migrants. This sum is deflated by a district dummy and car ownership. The results suggested that high transaction costs faced by rural households limit their access to formal credit markets.

Some studies used proxy variables to indirectly assess the effects of transaction costs. Most of the studies pertaining to market access of small-scale farmers tended to identify factors that affect agricultural market access. Although not formally referred to, some of these factors tended to reflect the transaction costs. For example Makhura (1994) determined factors affecting commercialisation of small-scale farmers in the former Kangwane area of Mpumalanga. The study suggested

that access to agricultural information, the use of formal marketing channels and information management were distinguishing factors indicating that farmers belonged to one group, as compared to another, on the basis of their market participation. These factors, however, were not significant for determining the level of their participation. Other factors relating to assets, location factors and household structure significantly affected both association with particular groups, as well as the level of market participation.

There are currently a few ongoing studies in South Africa, which show there are some emerging patterns. The study by Karaan (1999) was set to describe the transaction costs associated with mussel mariculture in Saldhana Bay. This study aimed at identifying an appropriate farm model. Four models were compared and agricultural franchising was found to be the most suitable model since the advantages of the efficiency of small-scale production are retained while high transaction costs are circumvented through a more effective vertical integration.

The other study by Matungul (2000a) examines household decisions relating to the sources of purchased food in two KwaZulu-Natal districts. The results show that the vast majority of respondents engage in both personal and impersonal transactions, and that between 30 and 40% of the respondents purchase staple foodstuffs from neighbours. Most households purchased food in towns where they had formal bank accounts. Outlets without banking facilities and supermarkets were avoided. Matungul's study further aims to assess the marketing patterns for crops and vegetables in the study area (Matungul, 2000b).

Research by Mathye *et al* (2000) and Mathye (2001) apply the transaction cost problem to market access in the Northern Province. These studies seek to determine how transaction cost factors influence farmers choice among marketing channels for mangoes and bananas. The current study differs from Mathye (2000; 2001) and earlier efforts in South Africa by showing that households face a two-stage decision problem in accessing output markets. The first decision is whether or not to trade (depending on fixed costs of market participation), and the second is how much to trade, which sets the conditions for participation as a seller.

2.5 SUMMARY

This chapter has provided a literature review of the role of transaction costs in smallholder agriculture. In fact, it attempted to explain different reasons for smallholder farmers not to participate fully in agricultural markets. TCE asserts that farmers will not use the markets when the value of participating is outweighed by the costs of undertaking the transaction. Transaction costs emanate from different sources. Generally these are household, location and commodity specific. These costs can be distinguished as observable costs, such as transport and administrative costs, and unobservable costs, such as cost of information and contract management.

In the literature the general impression is conveyed that the empirical development of the transaction costs approach has not kept pace with the theoretical development. Even though there is some development, at present merely theoretical models to analyse smallholder farmers' behaviour exist and major development is needed. In general, the practice is to apply neo-classical principles to develop transaction costs models for smallholder systems. Recently, there has been an avalanche of studies trying to contribute both to the theory and empirical understanding of transaction costs. In South Africa, however, such studies are still very limited.

This study attempts to add to the theoretical, but most importantly, to the empirical analysis of transaction costs behaviour of smallholders. In the subsequent chapters, the theoretical and empirical models will be developed to analyse the data collected in the Northern Province of South Africa.

CHAPTER THREE

A MODEL OF HOUSEHOLD MARKET PARTICIPATION UNDER TRANSACTION COSTS

3.1 INTRODUCTION

Many authors have recognised that analysis of smallholder market participation under transaction costs cannot be done by using standard economic models. Special theoretical and empirical models are required to understand the behaviour of smallholder farmers in market participation. This chapter provides a theoretical framework of market participation by resource poor households facing transaction costs. The empirical model is presented subsequently.

3.2 THEORETICAL MODEL

In this section a standard household model is constructed to determine the role of transaction costs in smallholder farming by specifying market participation (and hence revenue to access other goods) as choice variables. This follows largely on the recent work by Omamo (1998) and Key *et al* (2000). Their household models were an expansion of the model by de Janvry, Fafchamps and Sadoulet (1991) who were among the first authors to recognise the effect of market failures in smallholder farming. However, in constructing the model, elements from pioneering works in modelling smallholder market participation decision by Goetz (1992) and Strauss (1984) were also used. In constructing the model ideas from all of the mentioned studies were incorporated.

3.2.1 Market participation without transaction costs

Following Omamo (1998) and Key *et al* (2000), we consider a farm household maximising utility (u) by deciding on the consumption of k goods (c_k) production of k goods (q_k) and sales of k goods (s_k). That is, using i inputs for each product k (x_{ik}) the household can produce (q_k) which can either be sold (s_k) or consumed (c_k). Sales fits into the utility function through revenue generated from sales ($p_k s_k$), the sum of which is used to purchase other goods (represented by R_k). That is, the household will purchase an equivalent of R_k in other goods.

The neo-classical subjective equilibrium for a commercialising (or market participating) household will be given by the following:

$$\text{Max } U = u(c_k, R_k ; H_u) \qquad (1)$$

That is, household can either consume what it produces (c) or gain revenue to purchase other goods (R), given household characteristics (H_u). That is, H_u represents a set of factors shifting the utility function.

The utility maximisation is subject to:

$$\sum_{k=1}^{N}[p_k c_k + R_k] \leq \sum_{k=1}^{N}[p_k(q_k - s_k) + \mathrm{E}] \qquad (2)$$

or full income constraint, implying that expenditure on all purchase must not exceed revenues from all sales and transfers (E),

$$p_k c_k + p_k s_k + p_i x_{ik} \leq p_k q_k + R_k + e_k \qquad (3)$$

or commodity resource balance, stating that for each of the N goods, the amount consumed, used as inputs, and sold is equal to what is produced and bought plus the endowment of the good (e),

$$G = g\,(q_k\,,\, x_{ik}\,;\, H_q) \qquad (4)$$

or production technology that relates inputs (x_{ik}) to output (q_k), given the set of household characteristics (H_q) shifting the production function.

$c_k, q_k, x_i, s_k, R_k \geq 0$, where

$R_k = p_k s_k$, and

$s_k = f(c_k, q_k ; H_q, H_u, E)$ (5)

P_k (p_{ks} for selling price and p_{kc} for purchase price) and p_i are given market prices of good k and input i respectively. (6)

We can recap that E is exogenous transfers and other incomes (not from farming activities). The non-farm income is assumed to be exogenous since in South Africa it forms a major part of smallholder income, such that the small holder doesn't have to make decisions about it. More often when the household cannot generate such non-farm income itself there will be certain forms of transfers such as remittances or government grants. Then, e_k are endowments in good k. H_u and H_q are household and location-specific shifters in utility and production respectively, and G represents the production technology. It is noteworthy that c, R, s and q are defined and decided over k goods, where the set k covers all goods entering into production, consumption and the market (or commercial activity).

The household jointly makes its production, consumption and market participation decision subject to a number of constraints. The full income constraint (2) states that the equivalent of total expenditure on all purchases (or equivalent) must not exceed revenues from all sales and transfers. The resource equilibria (3) indicates that, for each k^{th} goods k, the value of what is consumed, sold, and used as inputs should not exceed the value of what is produced, bought plus the endowment of the good k. The production technology (4) relates inputs (x_i) required to produce output (q_k).

The Lagrangian associated with this optimisation problem to derive the supply and demand equations for a household participating in the market without transactions costs, is defined as:

$$\text{Max } L = u(c_k, R_k ; H_u) + \mu_k\left[\sum_{k=1}^{N} p_k (q_k - s_k) - R_k - p_k c_k + E\right] + \lambda [p_k (q_k - s_k) - p_k c_k - p_i x_{ik} + R_k + e_k] + \phi\ G(q_k, x_{ik}; H_q) \quad (7)$$

where μ, ϕ and λ are the Lagrange multipliers associated with the full-income constraint, resource balance equilibria, and technology constraint, respectively.

The optimal consumption, production, input use and market participation must, respectively, satisfy the following first-order condition (FOC), upon solving which the optimal supply and demand can be determined. These are the shadow prices of the constraint resource.

For consumption, the partial derivative of u (or L) with respect to c_k is:

$$\frac{\partial u}{\partial c_k} = \mu p_k + \lambda p_k \quad (8)$$

For other purchased goods, the partial derivative with respect to R_k is:

$$\frac{\partial u}{\partial R_k} = \mu - \lambda \quad (9)$$

For output, the partial derivative of G with respect to q_k is:

$$\phi \frac{\partial G}{\partial q_k} = -\mu p_k - \lambda p_k \quad (10)$$

For inputs, the partial of G with respect to x_{ik} is:

$$\phi \frac{\partial G}{\partial x_{ik}} = -\lambda p_i \quad (11)$$

For marketed goods, the partial derivative of G with respect to s_k is:

$$\phi \frac{\partial G}{\partial s_k} = -\mu p_k - \lambda p_k \qquad (12)$$

Using equations (8) and (9) subject to the full income constraint (2), we can solve for a system of demand equations for consumption, $c_k(p, I; H_u)$ and purchased goods $R_k(p, I; H_u)$. I is income redefined under full income constraint (Key *et al*, 2000).

Using equation (10) and (11) for profit maximisation, subject to (4), we can solve for output supply equations, $q_k(p; H_q)$ and inputs equations, $x_i(p; H_q)$.

Using equations (12) and (9) subject to constraint (5) we can solve for a system of market participation equations $s_k(p_k; H_q, H_u)$. This implies that market participation will be endogenously affected by prices, as well as by exogenously determined household characteristics. This supposes that participation in the markets is just a response to an observable price signal.

3.2.2 Market participation with transaction costs

As indicated earlier, market participation with exchange of output in the market is not cost free. The decision price faced by the farmer may differ from the observable price, due to the existence of transaction costs. These costs can be observed but are generally unobservable. However, the unobservable transaction costs can be explained by certain factors (such as assets and information) that can be observed. The transaction costs can vary with amount exchanged (variable transaction costs, TVC) or can be fixed regardless of amount exchanged (fixed transaction costs, TFC) (Key *et al*, 2000). Transaction costs in smallholder farming arise from a household's differential access to assets and information asymmetries, and different households face different transaction costs. Education and contact with extension, as proxies for information, represent fixed transaction costs, while ownership of arable land, livestock and transport facilities represent variable transaction costs.

The existence of transaction costs will lower the price effectively received by a seller - thus discouraging market participation on the one hand. On the other hand, they

raise the effective value of production consumed by the household resulting in a higher level of consumption and a lower level of market participation. As such, the transaction costs tend to widen the price band (Minot, 2000) and if the decision price falls within the band, the household will not participate in the market (Sadoulet *et al*, 1995).

The objective function of the household under transaction costs becomes

$$\text{Max } U_t = u_t(c^t, R^t; H_u) \qquad (13)$$

Subject to:

Full income constraint under transaction costs

$$\sum \tau_k^s [p_k - t_{vc}(h_t)](q_k - s_k) - \tau_k^s R_k^t - \tau_k^c [p_k + t_{vc}(h_t)]c_k - \tau_k^s t_{fc}(h_t) - \tau_k^c t_{fc}(h_t) + E \geq 0 \qquad (14)$$

with the resource balance equilibria affected by transaction costs in the similar way, where $\tau_k^s = 1$ if $s_k > 0$ and $\tau_k = 0$ if $s_k = 0$. R_k^t is the revenue gained under transaction costs and $R_k^t = 0$, when $s_k = 0$, and $R_k^t \leq R_k$. The $\tau_k^c = 1$ if $c_k > 0$ and $\tau_k^c = 0$ if $c_k = 0$.

These conditions imply that when the household is not participating in the market variable transaction costs will not exist, and the fixed transaction costs (t_{fc}) will determine whether the household participates or not. That is, the household's response to transaction costs involves either switching from participating in one market to the other and/or from participating in the market to consuming.

We can then derive supply and demand equations conditional on market participation of household facing both fixed transaction costs (t_{fc}) and variable transactions costs (t_{vc}). The Lagrangian is defined as:

Max $L_t = u_t (c^t, R^t; H_u)$

$$+ \mu \sum \tau_k^s [p_k - t_{vc}(h_t)](q_k - s_k) - \tau_k^s R_k^t - \tau_k^c [p_k + t_{vc}(h_t)]c_k - \tau^s t_{fc}(h_t) - \tau_k^c t_{fc}(h_t) + E$$

$$+ \lambda [\tau p_k (q_k - s_k) - \tau p_k c_k - \tau p_i x_{ik} + \tau R_k + e_k]$$

$$+ \varnothing G(q_k, x_{ik}; H_q) \qquad (15)$$

In this problem, the optimal solution cannot be found by solving the FOC since the presence of t_{fc} creates discontinuity in the Lagrange. This requires consideration of Kuhn-Tucker conditions (Instriligator, 1971; Silberberg, 1990, Nicholson, 1992). To be exact, the solution requires two steps as postulated in Key *et al* (2000). That is, we first solve for the optional solution on condition of market participation, and then choose the participation level leading to highest level of utility. When transaction costs can be specified as fixed cost (for example a credit constraint) then we can get a per unit shadow price (or the Lagrange multiplier) for that constraint.

The FOC for the equation 15) are:

For consumption of own production

$$\frac{\partial u^t}{\partial c^t} = \mu \tau^c (p_k + t_{vc}(h_t)) + \lambda \tau^c (p_k + t_{vc}(h_t)), \qquad (16)$$

For consumption of purchased goods

$$\frac{\partial u}{\partial R_k} = \tau_k^c \mu (p_k + t_{vc}(h_t)) - \tau_k^c \lambda . (p_k + t_{vc}(h_t)), \qquad (17)$$

For output produced

$$\phi \frac{\partial G}{\partial q_c} = -\mu \tau_k^s (p_k - t_{vc}(h_t)) - \lambda \tau_k^s (p_k - t_{vc}(h_t)), \qquad (18)$$

For inputs used in production

$$\phi \frac{\partial G}{\partial x_{ik}} = -\lambda \tau_k^s (p_{ck} - t_{vc}(h_t)) \qquad (19)$$

For marketed goods

$$\phi \frac{\partial G}{\partial s_k} = -\mu \tau_k^s (p_k - t_{vc}(h_t)) - \lambda \tau_k^s (p_k - t_{vc}(h_t)) \quad (20)$$

The income constraint takes two forms:

When the household participates, the change in utility as a result of unit change in μ will be equivalent to income constraint in (14) which has both fixed and variable transaction costs. However, when the household is not yet participating

$$\frac{\partial L_t}{\partial \mu} = -\tau_k^s t_{fc}(h_t) - \tau_k^c t_{fc}(h_t) + E = 0 \quad (21)$$

We can then solve for systems of demand equations under transaction costs

$$c_k^t = c_k^t (p_t + t_{vc}, I; h_u) \quad (22.1)$$

$$R_k^t = R_k^t (p_t - t_{vc}, I; h_u) \quad (22.2)$$

The systems of output supply equations under transaction costs;

$$q_k^t = q^t (p_t - t_{vc}; h_q) \quad (22.3)$$

Input equations

$$x = x(p_i, h_q) \quad (22.4)$$

and the system of market participation equations is given by

$$s_k^t = s^t (p - t_{fc}; h_q, h_u)$$

depending on whether $\tau_k^s = 0$ or 1,

and

$$s_k^t = s^t (p - t_{vc} - t_{fc}; h_q, h_u)$$

when $\tau_k^s = 1$ (22.5)

Two points to note in this regard are that:

1) Transaction costs affect all systems of equations. For example, the utility maximisation under transaction costs is different from the one when transaction costs are assumed not to exist (Key *et al*, 2000). Under transaction costs more of the production will be consumed since producers will be valuing output consumed at $P_k + t_{vc} \geq P_k$, and they will be saving on a higher purchase price.

   On the other hand, less of other goods (R_k) will be consumed since there is less propensity to participate in the market. In a graph, these would be reflected by a twist in indifference curves and an inward shift of the full income constraint.

2) The household's market supply without transaction costs is a function of prices and household characteristics, i.e.
   $s_k = s\ (p, h_u, h_q)$

With transaction costs, the supply equation becomes (22.5), which is a function of fixed transaction costs when the households makes a decision to participate, but is affected by both fixed and variable transaction costs when the household effectively participates. That is, both the fixed and variable transaction costs will affect the magnitude of supply. They are likely to change the slope of the sales curve in the graph showing the quantity supplied and the revenue received or other goods acquired. However, the fixed transaction costs will shift the supply curve with respect to both R and Price - thus increasing the threshold at which market participation can take place, that is, when production under transaction costs is greater that what households would prefer to consume when the transaction costs are too high. Extremely high transaction costs (particularly fixed transaction costs) will lower the decision price considerably so much so that it might not be worthwhile to participate in the market.

It should further be noted that the consumption is a residual of production and market participation;

$q(p - t_{vc}, h_q) - s_k^t(p - t_{vc}, h_u, h_q) = c(p + t_{vc}, h)$

Thus market participation and consumption are inversely related. By determining one equation, the other equation is automatically determined in reverse.

Following Abdulai and Delgado (1999), the decision price for selling is the marginal value of household's commodity when all of it is allocated to consumption. It is obtained from equation (22.5) by setting the amount sold equal to zero (i.e. s = 0) and solving for $P_k = P_k^d$. The equation for shadow decision price will be given by

$$P_k^d = P_k^d(t_{fc}, p_k, h_q, h_u) \qquad (23)$$

3.3 EMPIRICAL MODEL

The econometric specification of the preceding model consists of market participation decision equations and market supply equations estimated separately for horticultural crops (k = 1), livestock (k = 2), maize (k = 3) and other field crops (k = 4). If the observed market price (P_k^m) of a commodity is greater than the shadow (decision) value (P_k^d), a positive amount of sales will be observed for the commodity.

Equation (22.5) shows that a decision to take part in the market depends only on fixed transaction costs, while the market supply (conditional on the market participation decision) will depend on both fixed and variable transaction costs. Thus, when fixed transaction costs are overcome (or a certain threshold is reached), positive values of supply (sales or market participation) will be observed for a particular commodity. Key *et al* estimated a structural model keeping separate the supply functions from the production threshold functions. In this study, we follow a standard unbiased estimation of the model based on the joint estimation of the reduced form of the market participation decision and supply function.

The empirical supply and transaction costs equation can be defined as a linear expression in parameters,

$q_k(p, h_q) = P_k\beta_{sk} + h_q\beta_q$

$t_{vc}^{s} = -h_t\,\beta_{vc}$, for variable transaction costs, and

$t_{fc}^{s} = -h_t\,\beta_{fc}$, for fixed transaction costs,

which leads to linear expressions for supply by sellers, s_k as;

$$s_k = P_k^s + h_t\,\beta_{vc} + h_t\,\beta_{fc} + h_q\beta_q \qquad (24)$$

where the h's are the household characteristics affecting transaction costs and production respectively. The market participation indicator variable (s_k^*) for commodity k can be defined as

s_{ik}^* = 1 if $P_k^m \le P_k^d$

and

s_{ik}^* = 0 if $P_k^m > P_k^d$

The econometric specification is obtained by adding error terms to the supply equations and defining market participation with a zero threshold as following Kelly *et al* (2000);

$$s_k = P_k + h_t\,\beta_p + h_t\beta_{fc} + h_q\beta_q + \mu_{sk}$$

$$\equiv \beta_p^s x_{sk} + \mu_{sk} \qquad (25.1)$$

where x_{sk} is a vector of exogenous explanatory variables such as personal, household and location characteristics that influence market participation; and u_{sk} are random disturbance terms for the population of all the commodities. The probability of participating in the market can then be specified as:

pr(s* = 1) = pr($P_k^m > P_k^d$) = pr($P_k + h_t\,\alpha_{fc} + h_q\alpha_q > \varepsilon_{sk}$)

with a reduced form for probability of market participation;

$$\text{pr}(s^* = 1) \equiv \alpha_p^s x_{sk} + \varepsilon_{sk} \qquad (25.2)$$

This model is based on a dichotomous selection mechanism. This will then follow Heckman's two-stage estimation approach.

3.4 SUMMARY

The chapter has introduced the conceptual framework for analysing the effect of transaction costs in the commercialisation of smallholder farmers. Since the smallholders make both production and consumption decisions simultaneously, a utility maximization problem is applied in the decision of production, consumption and sales. Under transaction costs, the decision price is reduced which subsequently reduces the market participation. The household faces a two-stage decision problem. Firstly, the fixed transaction costs influence the household's decision to participate or not to participate. Secondly, when the household is participating, both fixed and variable transaction costs affect the level of participation.

The econometric model shows a specification of the market participation process for commodities with respect to a range of explanatory (and or policy) variables that encompass transaction costs factors as well as household characteristics that have a bearing on transaction costs. In the next chapter, the various variables are evaluated for consideration into the model specification. In the subsequent chapter, the specified models will be estimated.

CHAPTER FOUR

HOUSEHOLD CHARACTERISTICS AND PATTERNS OF MARKET PARTICIPATION

4.1 INTRODUCTION

In the previous chapters it has been shown that smallholder farmers fail to access agricultural markets due to transaction costs. These transaction costs emanate from differential access to assets and information, and tend to be household specific. Some empirical studies have found that specific household characteristics contribute to the existence of transaction costs. The empirical model for this study requires information about market access and participation, as well as sources of transaction costs that might be resulting from household characteristics.

This chapter provides an overview of the characteristics of the sample households in order to assess the variables for the specification of the model. The means are computed across all households since the model to be estimated incorporates all the observations. Prior to this the socio-economic characteristics are discussed. Then, the commercial orientation of the households is presented giving a breakdown of the households' farming activities. The last section discusses the characteristics of participants related to different enterprises. In this case the means are computed per participating group. Some of the salient statistics are provided in Appendix one.

4.2 SOCIO-ECONOMIC CHARACTERISTICS OF SAMPLE HOUSEHOLDS

The conditions of livelihood in the rural areas are to a considerable extent reflected in the socio-economic factors of households, which in turn influence the households' economic behaviour. This section discusses the socio-economic characteristics of the sample households in the study area. The section is divided into three subsections. The first subsection provides the structure of the households. The

asset structure is presented in the second subsection, while the third subsection discusses factors of physical location and information access.

4.2.1 Household structure

The structure of the households is presented in terms of family size and participation of members in various activities. Table 4.1 shows the size and structure of the household.

4.2.1.1 Household size

In the study area, the typical sample household consists of about seven members, which is common to many rural households. Of the seven members, about five are children and the other two adults. In a number of instances the household has only husband and wife (or no husband), while in other cases some households consist of extended families (grandparents, in-laws, and other relatives). In a typical sample household the ratio of male to female members is more or less the same, with the number of female members being slightly higher.

Table 4.1: Household size and structure

Variable	N	Mean (Std Dev)*	Minimum	Maximum
Total male members (MALEMEMB)	155	3.50 (1.83)	0	10
Total female members (FMALEM)	154	3.82 (1.99)	1	12
Number of children (CHILDREN)	150	5.34 (2.90)	0	20
Total family members (TFAMILYM)	154	7.28 (3.10)	2	22

* Values in braces are standard deviations (Std Dev)

For the specification of the model, the household size needs to be adjusted to the adult equivalent (AE) based on the ages of the participating household members. The purpose of the adjustment is to adjust the discrepancy of combining dependents (or predominantly consumers) and potential labour (or predominantly producers). To make the adjustment to potential labour the schedule as suggested by Chayanov

(1986) is adopted. Thus male members older than 26 years old counted as 1 unit and female members counted 0.8 units. Those household members in the age group between 21 and 26 counted as follows: 0.9 for male and 0.7 units for female members. Male and female household members between 15 and 20 years old are counted as 0.7 and 0.6 units for male and female members, respectively. Those members whose ages fall in the 8 to14 years age group count as 0.5 units.

Table 4.2 indicates that a typical sample household has about five AE members. 25% of the households have fewer than 3.5 AE members, while about 25% of the households have more than 6 AE members. Based on similar weightings for household members, who indicated that they are involved in farming, it is found that a typical sample household has about 2.58 AE members, .25% of the households have fewer than 1.80 AE members, but also 25% of the households have more than 3.5 AE members involved in farming. These statistics show that not all household members are involved in agriculture. In actual fact, most of household members are involved in other activities, or may just be consumers.

Table 4.2: Household size in Adult Equivalent

Source		Mean*
Number of members	156	4.91 (1.97)
Number of members in agriculture	155	2.58 (1.58)
Share of members in agriculture (%)	155	56.61 (30.71)

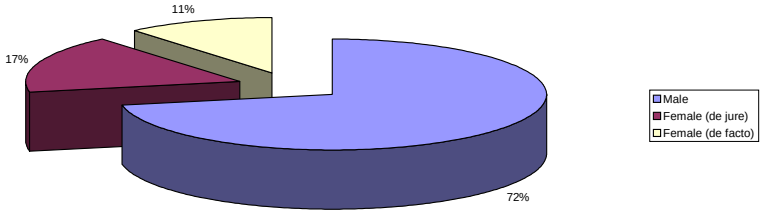
* Values in braces are the standard deviations

4.2.1.2 Gender, age and education of the head of the household

Normally the head of the household is responsible for the co-ordination of the household activities. As such it is pertinent to include some attributes such as gender, age and education of the head in the specification of market participation decisions. Of the 156 households who responded, 72% of the households are headed by men (Fig 4.1). In the rural areas of South Africa, and particularly in the Northern Province, the male heads of the household (the husbands) tend to migrate

to the urban centres to seek work. In their absence wives are left to take many decisions about household matters as *de facto* (functional) head. In 11% of the households this is the case. In addition, 17 % of the households in the sample are headed by a *de jure* (legal) female head. In total, about 28% of the households in the sample are effectively headed by women.

Fig 4.1: Gender of household head



The age of the head of the household is considered a crucial factor, since it determines whether the household benefits from the experience of an older person, or has to base its decisions on the risk-taking attitude of a younger farmer. Typically, heads of households are about 57 years of age (Table 4.3). The distribution of this variable is normal with the mean virtually at the centre of the range. The youngest head is 31 years old, while the eldest is 82 years of age. Another attribute of importance pertains to the level of education attained by the heads of the households, who, normally, are the decision-makers. Typically, heads of the households would normally have attained about grade six of formal education. This level affords the person with ability to do basic communications for business purpose. However, there are some households who have achieved tertiary level of education. Those are more able to interpret information better than those who have less or no education.

Table 4.3: Age and education of the head of the household

Variable	N	Mean	Std Dev*	Maximum
Age of head of the household	150	57.57	11.55	82
Age of second household member	141	46.26	12.21	73
Education of head of the household	132	6.24	3.99	15
Education of second household member	129	7.13	3.85	15

* Standard Deviations

4.2.2 Household endowment (assets)

The previous sub-sections focused on the human resource endowment of the rural households in the study area. The next section addresses the physical endowment. There are three types: fixed assets (land), mobile assets and financial assets including non-farm income.

4.2.2.1 Land

Insufficient land constitutes one of the most constraining resources facing rural households in South Africa. Typical sample households try to gain access to both residential and production sites. In the study the area of land accessible to rural households includes residential land, arable land and grazing land. Table 4.4 shows that, in reality, households have access to very small pieces of land. In fact, the problem of access to land was found to be common all farmers. Normally, the rather limited residential site is supposed to accommodate houses (40%), a kraal (15%) and backyard cropping activities (45%). The minimum area found in the study is about 0.2 ha, and the maximum of 1.20 ha.

Table 4.4: Size and access to land

Type of land	N	Mean	Std Dev*	% Owning	Maximum
Residential area (ha)	76	.26	0.18	100	1.20
Arable land area (ha)	151	3.11	3.68	99	27.50

* Standard Deviations

Though almost all households in the sample have access to land for crop production, the major problem is the size of the plot. A typical sample household has access to about 3.11 ha of arable land, with the largest plot being 27.50 ha and the smallest

about 0.5 ha. Those households with a very small area of arable land are generally dependent on the communal grazing land for agricultural purposes. It is found, however, that it is hardly plausible to measure the size of communal grazing area accessible for individual households. In actual fact, the number of livestock, discussed below reflects the level of access to grazing land.

4.2.2.2 Mobile assets

Table 4.5 shows ownership of mobile assets. For many households livestock is a source of social status. Hence, the majority of households own livestock, such as cattle, goats and sheep. Only about 38% of households do not have livestock.

Table 4.5: Ownership and highest value of mobile assets+

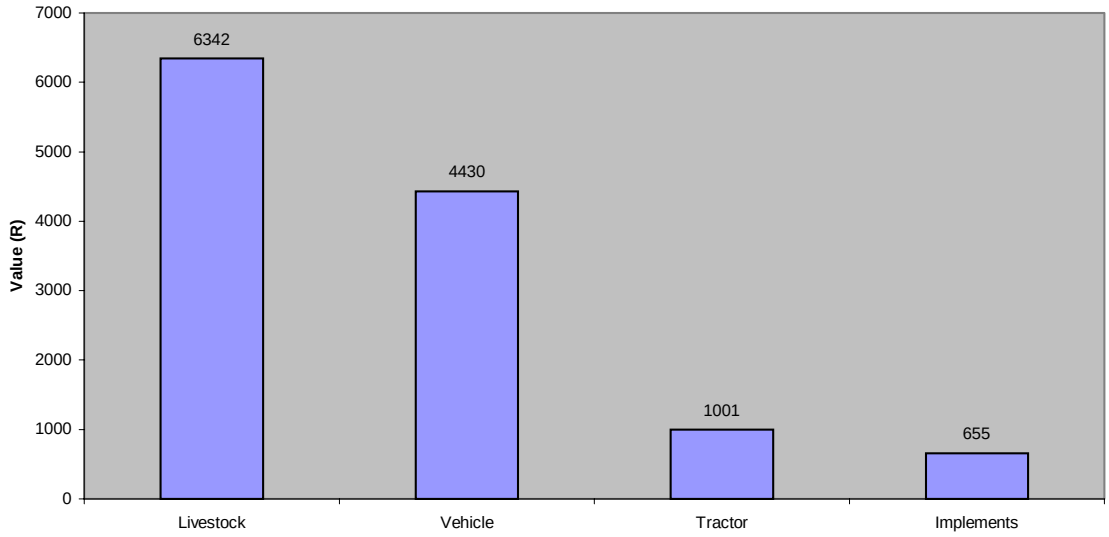
Variable	N	% Owning
Livestock ownership (R)	157	62
Implements ownership (R)	154	100
Tractor ownership (R)	150	6
Vehicle ownership (R)	150	15

Other mobile assets include vehicles, tractors and agricultural implements. Generally, very few households own such assets. As shown in Table 4.5 only 6% and 15% of the households own tractors and vehicles, respectively. These households tend to provide mechanisation services to other farmers. In addition to having a higher status in the community, these households also tend to have good connections with individuals and institutions outside their immediate communities.

The relative values of the mobile assets are shown in Fig 4.2. Livestock is the most important mobile asset for rural households. The reason for this might be that livestock might be obtained easily since it is bread locally. Moreover, the units are more divisible. Hence for the purpose of the model specification, the value of livestock is included as one measure of assets endowment and social status. The ownership of a tractor and/or vehicle is an exclusive asset in rural communities. These assets are normally owned by a small number of well-to-do households. For

this reason the ownership of a tractor and/or a vehicle are combined to increase the number of observations for the model.

Fig 4.2: Mean values of household mobile assets



4.2.2.3 Financial assets

As households integrate with the monetary economy, they tend to depend more on financial assets. Thus, households use financial services to provide for such liquid assets. About 58% of the households who responded have savings accounts (Table 4.6). Other financial assets are insurance policies. Only 24% of the responding households have insurance policies. Since these variables have many missing values, they are not included in the specification of the model.

Table 4.6: Financial assets

Asset	N	Mean Proportion
Have savings account (%)	121	58
Have insurance (%)	128	24

4.2.2.4 Non-farm income

Almost all the households in the study area depend on a combination of agricultural and non-agricultural activities for their livelihood. This section aims to discuss the non-farm income generating activities of the rural households in the study area. In general households invest non-farm income in farming activities such as buying inputs and paying for outside labour. Non-farm income is also used to finance marketing activities. As such, access to non-farm income has a bearing on market participation.

Table 4.7 provides a summary of the various sources of income of the surveyed rural households of the Northern Province. These sources include business, pensions, services provision, salaries and wages. Generally, very few households get their incomes from business activities. On average a typical sample household gets about R1524 per annum from business (agribusiness, retail, and hawking) and about R2120 from services. About 31 households receive income from providing services. These services include activities provided by household members based on their skills, e.g. income from jobs such as electricians, bricklayers etc. Another major source of income is wages and salaries. 75 households in the sample depend on these.

Another source of income is pensions. About 50% of the surveyed households have at least one member of the household receiving an old age pension. These are normally paid out to female senior citizens aged 60 and over and to male senior citizens of 65 years and over. After 1994 all the payments were R420 per month (or R5160 per annum). This entails that the interpretation of the mean earnings from pensions is not appealing as compared to the mode, which would imply that most of households have one member receiving pensions.

Table 4.7: Non-farm and total income of surveyed households (R)

Source of income	N	% Receiving income	Mean	Standard Deviation
Agribusiness	157	9	575	3616
Retail	157	5	621	3892
Hawker	157	9	328	1999
TOTAL BUSINESS	*157*	*20*	*1524*	*5733*
Services	157	20	2120	7029
Pension	157	50	3600	4037
Salaries	157	16	5589	15707
Wages	157	35	3319	6281
Subtotal of salary and wages	*157*	*47*	*8975*	*17033*
Agricultural sales	157	50	2907	7738
Value of exchange	156	48	3816	7965
Value of own consumption	156	67	4547	8011
TOTAL	157	100	21365	20434

Non-farm income influences transaction costs by facilitating access to information and supporting the transportation of products to the market in cases when there is no capital budgeted from the farm income. Furthermore, non-farm income can serve as a security against the risk of market failure. As indicated in the literature, market uncertainties do contribute to transaction costs. For the model, non-farm income is specified into two variables: one indicating pensions earnings and another indicating the aggregation of other non-farm activities. The aggregation of non-farm income is motivated by the few cases of individual income sources. Generally speaking, earners of pensions tend to behave differently from earners of other incomes. A reason might be that pension-earning farmers (likely to be decision makers) are elderly and it follows that their response to market incentives might be different.

4.2.3 Location and access to information

Transaction costs also emanate from factors relating to location and access to information. For example, those households located closer to market centres will experience lower transaction costs since they can get information more easily. At the same time, better access to information will reduce the transaction costs.

4.2.3.1 Access to business centres

Usually farmers do most transactions at centres mainly located in service centres, nodal points, business centres or major towns. Good access to such centres might imply low transaction costs.

Pietersburg, which is the main city of the Northern Province, is a major potential market centre where a variety of markets are available. For example, there are a fresh produce market, co-operatives, milling companies, and a variety of butcheries and supermarkets. So, the distance to this centre has a bearing on farmers' access to markets. The typical sample household in the survey is located about 104 km away from Pietersburg (Table 4.8). The closest household is located about 25 km from the city. These include the households in Maja and Mothiba areas.

There are other towns in the various regions to which households are closer. In the Northern region, the nearest town is Thohoyandou, Giyani is the most important centre in the Lowveld, Lebowakgomo in the Southern region, Mankweng or Pietersburg in the central region, and Potgietersrus or Ellisras in the Western region. Although these centres are not as big as Pietersburg, they are regional alternatives. They have co-operatives, roller mills and supermarkets, albeit on a relatively smaller scale compared to Pietersburg. Nonetheless, due to their proximity and their potential for service delivery, farmers tend to make use of the nearest towns for meeting their farming needs. Normally farmers know more about farming institutions in the nearest towns than they do about Pietersburg. Typical sample households are located about 27 km away from the regional centres. The furthest household is located about 60 km away. Unlike the variable indicating proximity to Pietersburg that is collineated, the proximity to the nearest town will be included in the specification of the model in kilometres.

Table 4.8: Access to business and service centres

Variable	N	Mean	Maximum
Distance to Pietersburg (km)	158	104	287
Distance to nearest town (km)	158	27	60
Road conditions to nearest town			
• Tarred (%)	158	32	
• Maintained gravel (%)	158	26	
• Gravel (%)	158	42	
Distance to hospital (km)	158	25	55
Distance to co-operative (km)	48	25	60
Distance to extension office (km)	158	3.27	25
Distance to agricultural office (km)	158	23	61

The conditions of the road are important in accessing these centres. About 26% of the households use maintained gravel roads to reach the nearest town, while 32% access the nearest town by tarred road. Thus, about 58% of the households use readily accessible roads to the nearest towns. 42% of the households have to rely on gravel roads in poor condition to reach the nearest town. For the specification of the model this variable is recoded into a single dummy variable, by regarding tarred and maintained gravel as roads in good condition.

Hospitals and co-operatives are other forms of market outlets for agricultural produce. Sometimes farmers need to visit hospitals because they might get tenders to supply produce to hospitals. Hence, their proximity to such centres is crucial. The typical sample household in the survey is located 25 km away from the hospital. The average distance to a co-operative is about 25 km, while the furthest distance is about 60 km. The variable of proximity to the hospital and the one to the co-operative are not included in the model due to collinearity problems and missing observations respectively.

The distance to the local extension office is an important factor since the interaction of the farmers with the extension office is crucial in making information available. The mean distance to the extension office is 3.27 km. The number of contacts farmers have with extension officers is about three (to be precise 3.26) times per month. Because farmers can obtain printed material on potential markets at the

district agricultural office, the distance to the office affects the cost of searching for information. On average households are located 23 km away from district agricultural offices.

4.2.3.2 Ability to communicate

Ability to read and interpret market information reduces the cost of the search for information. Most of the market information is written in English or Afrikaans. Only 41% of the heads of households can read English and/or Afrikaans. It follows that it is costly for the majority of households to gain access to written market information. Only 17% of the heads of households are able to read in more than two African languages. This variable, however, may not be crucial since little or no market information is available in the African languages. Information like this does, however, reflect the language barriers that exist among and within different ethnic groups.

Table 4.9: Ability to manage information

Factor	N	Mean
Member of a group (%)	128	55
Ability to speak at least two African languages (%)	155	32
Ability to speak English or Afrikaans (%)	155	43
Farmers keeping records (%)	141	53
Average education (years)	152	7.49
Farming learnt through extension contact (%)		71
Ability to write in English or Afrikaans (%)	155	39

For negotiation to take place and be successful a basic command of languages is needed. Most of the formalised markets will require communication in either English or Afrikaans. About 43% of the farmers can negotiate in English or Afrikaans. In contrast, some of the non-formalised markets require communication in the local (African) languages. In the study area only 32% of the farmers can negotiate in two or more African languages. This, however, applies more to direct sales, which in the rule happens within the local boundaries. Being able to negotiate in English and/or

Afrikaans will encourage exchange for finished products since most of the institutions dealing with these products are managed in Afrikaans or English.

The average education for a typical sample household is 7.49 years of formal schooling, which is equivalent to grade eight or form one (std 6). The least educated household has two years of formal education. In addition, nearly 40% of the heads of households can write English or Afrikaans.

The above information has provided a general picture about the socio-economic factors of the surveyed households. In sum, typically, the sample households have about five AE members. Most of the household heads are male, with a normal spread of age. Households have, generally, limited access to assets such as arable land, livestock, vehicles and tractors, as well as non-farm income. Farmers' location to the nearest towns provides them ample opportunity to interact with agricultural institutions. The conditions of the road to such towns also ensure accessibility of markets. It is found that most households make use of well-maintained roads, while some make use of non-maintained roads. For information's sake: on average typical sample households have completed their primary level of education, which enables them to conduct basic communication and interpret market information.

The factors mentioned above have a bearing on the existence of transaction costs and market access, and consequently participation in the market.

4.3 ACCESS TO AGRICULTURAL MARKETS – A DESCRIPTIVE OVERVIEW

This section provides a descriptive profile of market participation in the survey areas. The households' participation in agricultural markets is evaluated by, firstly, looking at patterns of access to agricultural cash markets, and, secondly, presenting other residual options of agricultural exchange and subsistence farming.

4.3.1 Patterns of market participation

To generate income, households sell all or some of their produce for cash. In many instances the activities generating such sales are as diverse as the product itself. In the households sampled, agricultural incomes are generated through the sales of both high value and food commodities. The high value crops include horticulture (fruit and vegetables) and livestock (large stock, small stock and poultry). The food crops include maize and other field crops. According to Table 4.10, 19% of the households sell horticultural crops (fruit and vegetables).

Table 4.10: Mean annual income from agricultural sales (R)

Source of Sales	N	Mean (R)	% Selling
Horticulture	?	1663	19
Livestock		492	17
Maize		293	21
Other field crops		459	22
Total agricultural income		2907	50

The mean sales are calculated for the entire sample since the empirical model to be estimated includes all the surveyed households. These means are given in the same table. Seventeen percent of the households sell livestock and about 20% of the households sell maize. Furthermore, about 22% of the households sell other field crops (wheat, groundnuts, beans, melon, and sunflower). It follows that almost 50% of the households sell their agricultural produce on the cash market.

The pattern of market access can be illustrated in two ways, that is, by the interaction among commodities, and through selling by regions.

4.3.1.1 Interaction among commodity markets

In accessing markets farmers do not necessarily focus on selling a single commodity. Some farmers are involved in selling more than one commodity. In that case, the farmers' involvement in one market may be affected by the involvement in another (Appendix 1.2). For example, three farming households sell horticultural

commodities and livestock. The conclusion can be drawn that these households are very commercially inclined as they are involved in high value commodities. Twelve farmers sell both horticultural and other field crops, while thirteen of horticultural crop sellers also sell maize. These are farmers who use both dryland and irrigation practices for commercial production. Six and eight farmers sell livestock, other field crops and maize. Finally, 13 of the farmers sell both maize and other field crops.

From the preceding paragraph it appears that livestock sellers are the least involved in selling other commodities. This implies that the marketing requirements of livestock and crops are different. One explanation is that due to constraints in market access, smallholder farmers might focus their resources on selling either livestock or crops. Another explanation is that farmers generally seem to choose one of the high value commodities, which include livestock and horticulture, and thus only a few farmers are involved in selling the particular types of commodities.
There is no strong interaction among major commodities. The models specified will therefore be based on individual commodities in the assumption that the behaviour of farmers in market participation focussing on a particular commodity will not be affected by the selling of another commodity.

4.3.1.2 Participation by region

The second pattern of agricultural sales has a regional or district dimension. Table 4.11 indicates the proportion of households participating in various markets by region. The Northern Region appears to have the largest proportion (83% of 24 households) of households participating in markets. The farmers in this region have the highest proportion of the 24 households selling maize and horticulture crops, that is 63% and 50%, respectively. This might be attributed to the fact that most of the farmers are relatively close to Thohoyandou, the nearest town, and most of them are reasonably well endowed with assets. For example, it is found that a number of farmers is also involved in other business activities, or earn salaries. One respondent in the region owns a taxi fleet, vehicles, and a car repair workshop. Given his business orientation this farmer is likely to participate in the agricultural markets.

In the Southern Region, 67% of the households surveyed sell some or all of the crops to markets. About 48% of the households sell other field crops, in most cases wheat and coriander produced in the Mathabatha irrigation project. About 19% of the households sell horticulture and maize crops. The market accessibility in the region could be attributed to the project being situated in Mathabatha, where farmers are supported with a focused extension service that facilitates farmers committees. Members of such committees are usually well informed about farming activities in the project. During the survey, one secretary could produce all the records of the sales and income of the various enterprises. This group of farmers is also involved in searching and negotiating markets for the project. Wheat is produced and sold by farmers as a co-operative activity. As a side effect it is found that nearby farmers who are not part of the project also benefit from the arrangements in selling maize and horticulture produce.

Table 4.11: Percentage households selling cash & food commodities by region

Region	Horticulture	Livestock	Maize	Other field crops	% Selling by region
Northern (N=24)	50	17	63	33	83
Lowveld (N=18)	39	22	17	0	56
Central (N=58)	0	23	9	9	31
Southern (N=27)	19	15	19	48	67
Western (N=30)	17	7	13	23	43
% Selling by commodity	19	17	20	21	50

NB: Entries are by cell (not across column nor row)

In the Lowveld region about 56% of the households sell agricultural products to the market. The commodities with a strong commercial orientation are horticulture (39%) and livestock (22%). The level of horticulture commercialisation in the region is attributable to a banana project at Homo where each farmer owns at least 7,5 ha of banana plantation. During the survey, farmers were harvesting and used predominantly female labour. The farmer with a pick-up truck was ready to transport the fruit to the market to be stored. The banana farmers also grew vegetables on the same banana plots. Other farmers involved in vegetable production are located in the Hlaneki area, about 7 km from Giyani. One of the

female farmers owns a large plot together and a retail shop. At the time of interview this farmer was harvesting tomatoes and some vegetables, which were taken to Giyani, the nearest town. Other vegetables were sold to the local community at the retail store. The livestock sellers were found at Mninginisi, approximately 25 km from Giyani. These farmers take their livestock to the feeding program before they are auctioned. Sometimes they sell them to the operator of the feedlot at a discounted price. This illustrates that farmers are generally interested to participate in the market and many of them do participate when conditions allow.

The extent of market participation by the households surveyed in the Central and Western Regions is substantially less. In the Western Region only 43% of the households sells any of their crops or livestock. It is surprising to find such a small proportion of households selling livestock, given that the region is ideally suited for livestock production. This may be a reflection of poor market development or high transaction costs. The Central Region has the lowest proportion (31%) of households participating in agricultural markets. About 23% of the households in the area sell livestock, and just 9% sell maize and other field crops. The Central Region is also a livestock production region, but the area south of Pietersburg where the sample is taken is more of a maize production area. The high livestock market participation may be attributed to small stock and poultry production, while the lower maize market participation may be substituted by the arrangement of "exchange" discussed in the next section.

4.3.2 Value of exchange and subsistence production

In some instances farmers cannot access direct cash markets since they may have food security considerations. In these cases, households exchange agricultural products for processed products. This is an alternative institutional development in market access, where the value is added to the smallholder farmer's product without change in title. For example, farmers make an agreement with a co-operative, a milling company or a trading store to deliver their maize in exchange for maize meal. The costs incurred involve transport (about R10), milling cost (R22) and storage

costs (about R18). These costs are paid when farmers collect the maize meal. In the study area almost 50% of the households exchanged maize for the finished product.

Similar arrangements, particularly with local traders and consumers, applied to other products, so that the costs of exchange remain minimal. In terms of livestock, it is found that farmers would exchange one type for another type of livestock to be used for different purposes. Almost 25% of the households exchange livestock. According to table 4.12, about 49% of the households are involved in exchange arrangements.

Table 4.12: Households participation in markets (%)

Value categories	Household (%)
Sell for cash	50.3
Market exchange	48.7
Value of household consumption	
Not consume	30.6
R1 – R1000	42.0
R1001 and greater	27.4

The other alternative to cash sale is home consumption. The value of this process is derived from the quantity of consumed produce valued at the purchase price. Accordingly, the mean value of maize consumed is estimated at R384, that of other crops at R142 and livestock at R177. In total the mean value of household consumption is R705. The total value of consumption, agricultural sales as well as the exchanged goods is estimated at R4 547 on average. This is equivalent to 21% of the total household income of R21 365. The household consumption represents 15.5% of the agricultural income and 3% of the total household income.

4.4 PARTICIPATION IN DIFFERENT COMMODITY MARKETS

In the previous section, it is indicated that households sell mainly four types of commodities: horticulture, livestock, maize and other field crops. Five categories of households were consequently created for the dependant variable, namely those

selling horticultural crops, those selling livestock, maize, and other field crops. Finally, there are those households that do not sell anything (non-participants).

Following the classification of the respondents in different groups, bivariate means analyses are applied to compare the households participating and those not participating in each of the four commodity markets as identified for the purposes of this study. Households are compared with respect to their general inclination towards commercialisation, the indication of sales levels for commodities outside the particular market, and with respect to socio-economic and transaction cost characteristics.

4.4.1 The horticultural market

Households participating in the market for horticultural commodities are considered to be more commercially inclined due to the nature of the product. Horticulture crops are generally perishable and require immediate disposal. As such, farmers producing horticulture crops do so with intent to sell. In this study it is found that 19% of the sample households are selling all or a proportion of their fruits and vegetable harvest to a range of market outlets varying from informal markets to the large urban based fresh produce markets. Typically, many of the households producing fruits and vegetables also have access to a dryland plot where they commonly produce maize and/or other field crops.

This inclination towards commercialisation resulting from horticultural activities has also an effect on these households' commercialisation behaviour in the maize and field crop production, resulting in 45% and 41% of the households also selling maize and field crops, respectively. The relatively strong commercialisation behaviour of the households selling horticultural products is further illustrated by the comparison of means in Table 4.13.

Table 4.13: Comparing commercialisation behaviour between sellers and non-sellers of horticultural crops

Item	Non-participants N = 128	Participants N = 29	F-Statistic
Mean value of horticultural sales (R)	0	R9 005	45.47***
Selling maize (%)	15	45	14.11***
Selling livestock or products (%)	19	10	1.17
Selling other field crops (%)	16	41	9.29***
Mean value of maize sold	R213	R538	4.09**
Mean value of livestock sold	R448	R686	0.322
Mean value of other field crops sold	R359	R899	4.77**

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

When production and aspects of home consumption are considered, there seems to be very little difference between the two groups. Quantities of maize consumed and exchanged are almost the same with obviously no significant difference in the means. Only in the case of the home consumption of other field crops a significant difference is found with the participants consuming considerable more of their production. This could, however, also be an effect of higher yields (Table 4.14)

Table 4.14: Comparing production and home consumption between sellers and non-sellers of horticultural crops

Item	Non-participants N = 128	Participants N =29	F-Statistic
Maize production (# of 80 kg bags)	12.80	17.69	2.18
Home consumption of maize (# of 80 kg bags)	3.05	3.21	0.02
Maize exchanged for maize meal (# of 80 kg bags)	7.13	7.07	0.00
Mean value of livestock consumed	R193	R104	0.58
Mean value of other field crops consumed	R106	R302	10.28***

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

The next component of the descriptive analysis explores the difference in means for those variables that are likely to explain the difference in commercialisation behaviour of households producing horticultural crops. One would, obviously, expect that those households forming part of an irrigation scheme, and those farming with cash crops such as bananas would be more likely to participate in the market than other households. This study assumes, however, that certain socio-economic, wealth and spatial characteristics might also play important roles in

people's decisions to sell or not to sell. Table 4.15 provides a summary of the results.

One would expect that participating households are better endowed and have more access to liquid assets like income from other non-farm income sources such as pensions and wages which might assist in leveraging market access. It seems, however, that no such trend is emerging from the analysis of means. A stronger endowment position relates significantly to access of arable land and the ownership of a tractor and/or vehicle. 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 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.

Table 4.15: Comparing explanatory variables for horticultural sellers and non-sellers

Item	Non-participants N = 128	Participants N = 29	F-Statistic
Mean value of livestock owned (in R100)	69.54	36.40	1.32
Mean value of pensions earned (R)	3 877	2 386	3.27
Mean of salaries and wages earned (R)	8 755	9 937	0.112
Mean value of business income (R)	1 470	1 759	0.06
Mean age of household head (years)	58	57	0.01
Household head is female (%)	30%	14%	2.86*
Mean household size (AE)	4.99	4.56	1.13
Average education of household (yrs)	7.42	7.81	0.72
Mean size of arable land	2.30 ha	6.49 ha	37.86***
Ownership of vehicle or tractor (%)	14	31	4.87**
Proximity to nearest town	-28 km	-23 km	3.82*
Road conditions to nearest town good %	25	62	16.34***
Farming learnt through extension visits %	70	76	0.39

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

4.4.2 The livestock market

Households participating in livestock markets are considered commercially oriented since livestock production is a high value enterprise. In this study it is found that

17% of the households sell all or some of their cattle, sheep, goat and poultry at auctions, to the local community, as well as directly to markets.

Most of livestock producers also have access to arable lands for crop production, particularly dryland crops. The commercial inclination of livestock farmers also influences their attitude towards maize and other field crops markets. Table 4.16 shows that about 30% and 22% of the livestock market participants also sell maize and other field crops, respectively. Although the linkage between livestock and field crops markets is not clear, these enterprises tend to complement each other. Field crops are grown on arable lands in summer while livestock is allowed to graze in the grazing area. In winter, livestock is let into the arable lands for supplementary grazing. Perhaps, the complementarities in production could explain the positive, though not significant difference in market participation for livestock owners and those who are not. The returns from commercial activities for livestock sellers and non-sellers are shown by mean values in Table 4.16.

Table 4.16: Mean comparison of commercialisation behaviour of sellers and non-sellers of livestock

Item	Non Participant N= 130	Participants N = 27	F-Stats
Mean value of livestock sold (R)	0	2861	61.18***
Selling maize (%)	19	30	1.72
Selling horticultural crops (%)	20	11	1.17
Selling other field crops (%)	21	22	0.03
Mean value of maize sold (R)	199	633	7.04***
Mean value of horticulture sold (R)	1995	68	1.54
Mean value of other field crops sold (R)	513	198	1.50

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

The livestock sellers do not receive a significantly better price for maize, although the value of the maize sold is significantly different from those who do not sell livestock. Other livelihood indicators are not significantly different for livestock sellers in comparison with non-sellers of livestock. The livestock sellers produce more maize, but consume less. They do consume more of other crops, however, in all probability field crops (Table 4.17).

Table 4.17: Comparing production and consumption of sellers and non-sellers of livestock

Item	Non Participants N = 130	Participants N = 27	F-Stats
Maize production (# of 80 kg bags)	13.08	16.70	1.12
Home consumption of maize (# of 80 kg bags)	3.12	2.85	0.05
Maize exchanged for maize meal (# of 80 kg bags)	7.35	6.00	0.35
Maize producer price (R / bag)	63.24	65.00	0.39
Maize purchase price (R / bag)	127	121	3.51
Value of livestock consumed (R)	94.82	571	17.55
Value of other crops consumed (R)	95	571	0.97

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

The next analysis explores the difference in means for variables that are seen as explaining the difference in market participation behaviour of livestock farmers. It is anticipated that livestock farmers showing commercial inclination would have a better socio-economic standing, implying that they might face lower transaction costs. Table 4.18 shows the summary of the results of the different factors explaining the difference in behaviour of those who sell livestock in comparison with those who do not. Generally, there is a very weak pattern emerging from this analysis.

Table 4.18: Comparing explanatory factors for livestock sellers and non-sellers

Variable Description	Non-Participants N = 130	Participants N = 27	F-Stats
Value of livestock owned (in R100)	41	171	21.89*
Pensions earned (R)	3993	1720	7.36***
Salary and wages earned (R)	9602	5978	1.01
Income from business activities (R)	556	6144	24.25***
Household head is female	0.23	0.44	5.08**
Age of household head (years)	58.13	54.89	1.71
Household size in adult equivalent	4.98	4.57	0.95
Average education of the household (yrs)	7.44	7.72	0.36
Size of arable land (ha)	2.93	3.95	1.72
Ownership of a tractor or vehicle	15%	26%	1.74
Distance to nearest (regional) town	-27.35	-26.11	0.22
Road conditions to nearest town are good	33%	26%	0.52
Farming learnt through extension visits	73%	63%	1.07

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

Although it does seem that access to assets such as livestock and non-farm income tends to significantly differentiate between the sellers and non-sellers. Similarly, female-headed households show an inclination towards the selling of livestock. Earning of pensions also tends to distinguish sellers and non-sellers. The results suggest that most of the pension earners (typically elderly) are not motivated to sell livestock. It appears, however, that information and proximity to the nearest town does not show any importance in differentiating the selling and non-selling groups.

4.4.3 The maize market

The commercial orientation of households selling maize is normally viewed with scepticism since maize is mainly regarded as a food crop. The primary objective of producing maize is to meet consumption needs. Only when these are met farmers will consider selling some maize. Another reason for this concern pertains to the fact that maize is a low value commodity. As such, maize selling may also be a spill over of access to markets for other commodities. This is illustrated by the fact that about 41% of households selling maize also sell horticulture and other field crops. Only about 25% of the maize sellers also sell livestock. Table 4.19 shows the mean values of variables of commercial orientation of maize sellers and non-sellers.

Table 4.19: Mean comparison of commercial orientation between sellers and non-sellers of maize

Variable Description	Non-Participants N=125	Participants N=32	F-Stats
Selling livestock	15%	25%	1.72
Selling horticultural crops	13%	41%	14.12***
Selling other field crops	16%	41%	9.767***
Mean value of livestock sold (R)	352	1038	2.93*
Mean value of horticulture sold (R)	1582	1978	0.073
Mean value of other field crops sold (R)	352	875	4.82**

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

The production and consumption of maize is a pertinent factor when sellers and non-sellers of maize are compared. Table 4.20 provides the summary of results. Other

than maize sellers producing significantly more maize and getting a higher selling price than the non-sellers, the two groups tend to have very similar attributes.

Table 4.20: Mean comparison of production, prices and consumption between maize sellers and non-sellers

Variable Description	Non-Participants N=125	Participants N=32	F-Stats
Maize production (# of 80 kg bags)	9.15	31.47	69.85***
Maize consumed (# of 80 kg bags)	2.70	4.53	2.60*
Maize exchanged for maize meal (# of 80 kg bags)	6.49	9.59	2.13
Maize selling price (R / bag)	60.256	76.38	49.94***
Maize purchase price (R / bag)	126.87	123.34	1.29
Value of livestock consumed (R)	141.25	315.31	2.44
Value of other crops consumed (R)	144	134	0.03

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

Those farmers selling maize are believed to posses better attributes in the form of endowments and access to information enabling them to enter markets than those that do not sell. Table 4.21 summarises the means of the explanatory variables. Maize sellers seem to have more income from business activities, more arable land, own a tractor or vehicle, and they have access to better roads. These sellers also have fewer members in the household.

Table 4.21: Comparing explanatory variables for maize sellers and non-sellers

Variable Description	Non Participants N = 125	Participants N = 32	F-Stats
Value of livestock owned (in R100)	61.35	71.51	0.133
Pensions earned (R)	3638	3452	2.93
Salary and wages earned (R)	8549	10623	0.374
Income from business activities (R)	1048	3366	4.22**
Household head is female	0.29	0.19	1.42
Age of household head (years)	57.97	55.97	0.73
Household size in adult equivalent	5.12	4.11	6.97***
Average education of the household (yrs)	7.45	7.65	0.21
Size of arable land (ha)	2.53	5.25	15.01***
Ownership of a tractor or vehicle	0.14	0.31	5.71**
Distance to nearest (regional) town (km)	-28	-24	2.56
Road conditions to nearest town are good	0.27	0.50	6.27**
Farming was learned through extension visits	0.73	0.66	0.60

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

4.4.4 The other field crops market

The indicator of market participation of other field crops as constructed in the study aggregates several crops such as wheat, beans, coriander and grain sorghum. Some of the crops have higher commercial orientation, while other have less. Most of the farmers selling these commodities also sell other commodities: about 39% and 36% of the households also sell maize and horticultural crops, respectively. Relatively fewer farmers (about 18%) also sell livestock. Table 4.22 shows mean values of sellers and non-sellers.

Table 4.22: Mean comparison of commercial orientation between sellers and non-sellers of other field crops

Factor	Non Participant N = 124	Participants N = 33	F-Stats
Mean value of other field crops sold (R)	0	2182	180***
Selling maize (%)	15	39	9.77***
Selling livestock (%)	17	18	0.03
Selling horticultural crops (%)	14	36	9.30***
Mean value of maize sold (R)	225	457	2.29
Mean value of livestock sold (R)	574	185	0.95
Mean value of horticulture sold (R)	1707	1498	0.02

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

The production and consumption of sellers and non-sellers of other field crops are compared in Table 4.23. Apart from the maize produced and the mean value of other field crops consumed, there are no major differences emerging from this comparison. The fact that participants consume most of other field crops implies that selling depends on production. That is, the more of other field crops is produced the more likely that some will be sold.

Table 4.23: Comparing production and consumption of other field crop sellers and non-sellers

Factor	Non Participant N = 124	Participants N = 33	F-Stats
Maize produce (# of 80 kg bags)	13.11	15.91	3.51*
Maize consumed (# of 80 kg bags)	3.21	2.58	0.32
Maize exchanged for maize meal (# of bags)	7.16	6.97	0.01
Maize producer price (R / bag)	63.86	62.36	0.33
Maize purchase price (R / bag)	126	127	0.02
Value of livestock consumed (R)	170	200	0.07
Value of other crops consumed (R)	91	332	17.70***

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

The households selling other field crops do not have access to assets that distinguishes them from those who do not sell (Table 4.24). With the exception of wheat and coriander, field crops are normally sold locally. Buyers also tend to collect the product bought. In the case of wheat and coriander, farmers sell as a group. The field crop farmers have less (but not significantly so) livestock, pensions and wages than those who do not sell. However, they receive an insignificant higher amount in business earnings. They are located further away from the nearest town, but the majority (about 67%) accesses the town through good road conditions.

Table 4.24: Comparing explanatory variables of sellers and non-sellers of other field crops

Variable Description	Non-Participants N = 124	Participants N = 33	F-Stats
Value of livestock owned (in R100)	64.971	57.58	0.07
Pensions earned (R)	3671	3335	0.18
Salary and wages earned (R)	10010	5115	2.16
Income from business activities (R)	1340	2206	0.59
Household head is female (%)	29	21	0.73
Age of household head (years)	57.39	58.25	0.14
Household size in adult equivalent	4.90	4.93	0.01
Average education of the household (yrs)	7.39	7.87	1.31
Size of arable land (ha)	2.95	3.66	0.96
Ownership of a tractor or vehicle (%)	18	15	0.12
Distance to nearest (regional) town (-km)	-26.71	-28.76	0.683
Road conditions to nearest town are good (%)	23	67	27.07***
Farming was learned through extension visits (%)	72	70	0.04

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

4.4.5 Non-participants

About 50% of the respondents did not participate in any of the agricultural markets. It is commonly believed that these farmers consume what they produce. A typical sample non-participant household produces about nine bags of maize, of which three are consumed straight away and the rest is taken to the co-operative or miller for processing and storage. These farmers face the lowest maize price of about R60 per 80 kg bag. They also consumed the least in livestock and other crops.

The non-participants are generally not well endowed in assets. Access to other assets is most unfavourable in comparison to participants; the area of arable land is about 1.83 ha on average, and just less than one % of households own a tractor or a vehicle. These households, however, did receive the highest amount in pensions. The households are located furthest away from the nearest town and only 17% of the households have access to good roads.

4.4.6 A comparison of households participating in markets

The commercialisation process follows two ways. Firstly, farmers can transit from the low commercial (or non-participating) stage to a higher level of participation as seen in the previous section. The second pattern involves switching from participating in one market to another. This section compares the attributes of the five groups of market participants including the non-participants (see Appendix 1.3.). The objective is to evaluate the explanatory factors distinguishing one group from another. The question is what would be required to move households from one group to another.

4.4.6.1 Horticulture vs livestock sellers

In terms of access to assets, horticulture sellers have more land (of about 6.49 ha), more pensions, salary and wages, and a higher proportion of households owning a tractor or vehicle compared to the livestock sellers. The livestock farmers own three times more livestock than the horticulture sellers, as would be expected. The livestock sellers also have more income from business activities. The livestock farmers have a larger proportion of female-headed households, and more heads of the household in a younger age group. This tallies well with the low amounts in pensions received by this group.

In terms of the potential to access information, it is found that the two groups have about the same level of formal education. The horticulture sellers are located closer to the nearest town with twice as many households using accessible roads to town

compared to the livestock sellers. Most of the horticulture farmers receive their farming information through the extension service.

4.4.6.2 Horticulture vs maize sellers

The horticulture sellers typical have access to more land (a hectare more) and less livestock (twice less) than the maize sellers. Maize sellers typically have more access to earnings from pensions, salary and wages, as well as from businesses. The maize sellers appear to be more diversified than the horticulture farmers are. They have a slightly higher proportion of household heads that are female, and heads that are slightly younger and with more or less the same level of education.

The horticulture and maize farmers have a very slight difference in their locations to the nearest town. The horticulture sellers have a greater proportion of households using accessible roads. Furthermore, a higher proportion of these farmers has access to farming information from the extension service.

4.4.6.3 Horticulture vs other field crops sellers

The horticulture sellers have almost twice as much arable land, but have less value of livestock. A higher proportion of households in this group owns tractors or vehicles. These also have more earnings from salary and wages, but less earnings from pensions and business. Furthermore, a lower proportion of female-headed households in this group who are from the younger age group.

The education levels in both groups are relatively the same. The horticulture sellers are located relatively closer to the nearest town, but the same proportion of households in both groups has access to good roads. Most horticulture farmers get their information from the extension service.

4.4.6.4 Livestock vs maize sellers

The livestock sellers own more livestock, but less arable land than the maize sellers. They also receive more income from business, but less from pensions, salaries and wages. The livestock sellers have a larger proportion of female farmers and are slightly younger but with more AE members.

The livestock farmers are located further away from the nearest town and a smaller proportion of households have access to good roads.

4.4.6.5 Livestock sellers vs other field crops sellers

Livestock sellers own more livestock and arable land than sellers of other field crops do. They also earn more income from salaries and wages, as well as from business activities. However, these farmers receive less in pensions. They have a large proportion of female farmers with, typically, a younger age. The households are composed of relatively fewer AE members.

The households in both groups have more or less the same level of education. The livestock sellers are closer to the nearest town but a lower proportion of households has access to good roads. The proportion of farmers getting information from the extension service is lower.

4.4.6.5 Maize and other field crop sellers

Both these groups of participants are involved in low value enterprises. However, their attributes are different. For example, maize sellers are generally better off in terms of access to assets than the other field crop sellers. The maize sellers have more arable land, own more livestock, earn more non-farm incomes, and have a higher proportion of households owning tractors and vehicles.

The maize sellers are located closer to the nearest town, but have a lower proportion of households accessing good roads. The maize sellers have a slightly lower proportion of female heads of the household who are, typically, younger. They also have a slightly lower level of formal education.

4.5 SUMMARY

The evidence presented in the previous sections suggests that the sellers generally have better attributes in terms of assets and information to access. The sellers of high value crops have better access to assets and information than those who engage in low value crops.

A closer look into the descriptive statistics comparing the five categories of households indicates that livestock farmers tend to have more livestock, while the maize farmers have less than half of the livestock the livestock farmers have. Horticulture sellers have the lowest value of livestock owned. However, they tend to own more arable land and a higher proportion of households owning tractors or vehicles. In this respect they are almost equivalent to the maize sellers. Regarding access to liquid assets, maize sellers and horticulture sellers have the highest earnings from salaries and wages. Maize sellers and non-participants receive high amounts in pensions. Livestock sellers and maize sellers receive a higher income from business activities.

Livestock sellers, followed by non-participants, have a higher proportion of female-headed households. The other field crop sellers and non-participants consist of generally older households with more AE members. The sellers of other field crops, followed by the horticulture sellers, have a slightly higher level of education. They also have higher proportions of households using accessible roads. Horticulture and maize sellers are, typically, located closer to town. Horticulture sellers and non-participants tend to rely more on the extension service.

Based on the previous discussion, we assume that the attributes distinguishing horticulture sellers from the other groups include size of the arable land, ownership of a tractor or vehicle, the distance to the nearest town as well as contact with extension services. Access to salaries and wages, the education level and the road conditions might also play a role. The attributes distinguishing sellers of livestock from the other groups include the value of livestock owned, access to income from

business activities, and gender. Maize sellers are distinguished by access to salary and wage income, ownership of tractors or vehicles. The distance to the nearest town, ownership of livestock, income from pensions, business and arable land also plays a distinguishing role. Sellers of other field crops are distinguished by the age of the head of the household, average education, and road conditions. Income from pensions, and household size also play a role. Non-participants normally receive more income from pensions and they have the largest household size. Gender and age of the head of the household might also be contributing factors to non-participation.

Basically, the non-participants have less access to assets and information in comparison to participants. But also, participants tend to display different profiles of access to assets and information.

The next chapter will provide analytical tests to determine if these observed trends do, indeed, explain the commercial behaviour of different households.

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.

CHAPTER SIX

SUMMARY AND CONCLUSIONS

The previous chapters introduced the problem and the objectives of the study, as well as the theoretical framework underpinning the role of transaction costs in its relationship to market participation. Elaborate econometric analysis was undertaken to provide empirical evidence of the effect of transaction costs on commercialisation of smallholder farmers.

This chapter provides the summary and conclusions of the study. It is presented in four sections. The study is summarised in section 6.1, while section 6.2 presents the conclusions and policy recommendations of the study. Section 6.3 discusses the general policy implications, and section 6.4 makes recommendations for further studies.

6.1 SUMMARY

The main objective of the study is to investigate the extent to which transaction costs affect the market participation behaviour of smallholder farmers in the Northern Province of South Africa. In particular the study attempts to investigate factors contributing to different levels of transaction costs among households. Identification of such factors might support efforts to create the appropriate environment for smallholder farmers for integration into the mainstream agriculture market. After all, it is in the interest of the government to remove dualism in agriculture by promoting smallholder farmers, which hinges on greater participation in the market.

These farmers are generally poor and contribute inadequately to the mainstream market because of a low production and poor access to other options for obtaining a livelihood. It is found, however, that these farmers can survive economically when given a set of opportunities to transform them from subsistence to commercial operators. When smallholder farmers do participate in the market this might result in

strong multiplier effects. Very few smallholder farmers participate in the market. This is caused by a number of constraints, some of which have to do with transaction costs barriers.

The study applies the New Institutional Economics (NIE) paradigm, and in particular transaction costs economics (TCE). TCE asserts that market exchange does not take place in a frictionless environment; as a result all transactions are costly. Transaction costs facing smallholder farmers are generally unobservable but do inhibit possible participation in market exchanges, that is, when the costs of transaction are higher than the value (or utility) derived from such transaction, farmers will not participate in the market. Transaction costs emanate from differential access to assets and information, and these factors vary across households. The general view in the literature is that the presence of high transaction costs will affect the pattern and/or level of participation in the market.

A handful of researchers have attempted to provide a theoretical framework of smallholder farmers' market participation under transaction costs. Generally, they built upon the pioneering work of De Janvry *et al* (1991), who formalised the notions that had been around for some time and applied them to peasant agriculture. Goetz (1992), building on Strauss (1984) determined that fixed transaction costs discourage market participation. Some years later Omamo (1999) established that variable transaction costs (such as transport costs) will influence the pattern of market participation. Perhaps a more subtle framework for our purpose was proposed by Key *et al* (2000) who found that the decision to participate in markets is affected by fixed transaction costs, while the level of participation is affected by both variable and fixed transaction costs. These studies form the basis for the theoretical model of market participation under transaction costs used in this study. The model is designed to determine household's utility decision by choosing level of consumption of agricultural goods as well as the level of consumption of other goods acquired with the sales revenue. Furthermore, the model attempts to determine the factors influencing the household's decisions on how much to produce, as well as how much to sell (which enters the utility function as revenue).

In the presence of transaction costs, the level of market participation is conditional on the decision to participate in the market. It is hypothesised that such a decision to participate is affected by factors contributing to fixed transaction costs. Once the household has decided to participate, the level of participation will depend on factors contributing to both fixed and variable transaction costs.

There is consensus in the literature that the very existence of transaction costs tends to discourage commercialisation. Also, theoretical concepts confirm that alleviation of transaction costs will stimulate commercialisation of smallholder farmers. In order to operationalise the concept of transaction costs in this study, a range of variables was defined. The first set of variables represented access to assets. They included the size of the household's arable land, livestock ownership, transport assets and liquid assets. Other variables indicated access to information, such as distance and condition of the roads to market centres as well as direct access to market information. The rest of the variables reflected the socio-economic status of the household.

To measure these variables the study employs data from a 1997 survey of farming households in five regions of the Northern Province. This survey was held over a period of about four months. The data collection process involved interaction with approximately 158 individual farmers in elaborate face-to-face interviews, which were followed by 15 group discussions. It was found that particularly in the chosen study area, which is in the Northern Province, high transaction costs are in evidence.

Most households in the selected sample consisted of seven members, and most of them were headed by men. These households have access to a relatively small area of arable lands (about 3 ha), with livestock thriving on communal grazing. The households use different sources of livelihood, both in the form of farm and non-farm activities. The success of such livelihoods is constrained by lack of institutional support, such as appropriate ownership titles to land.

Farmers in the study area participated in markets focusing on high value commodities as well as on markets focusing on food crops. High value commodities

included horticultural crops and livestock. Food crops included maize and other field crops. Generally, few farmers were involved in the selling of any of these commodities. Only 19%, 17%, 21% and 22% of the households sold horticultural crops, livestock, maize and other field crops respectively.

The central question is "What will influence farmers' decisions to sell and what will stimulate them to sell more?" It was hypothesised that households with more endowment and better access to information will be more likely to sell and be encouraged to sell more.

In order to test the above hypothesis, different methods were followed. The selectivity models encompass two steps to estimate the effects of socio-economic and transaction costs factors on market participation. Firstly, probit models were estimated to determine (fixed transaction costs) factors affecting the decision to participate in markets focusing on horticultural crops, livestock, maize and other field crops. The results of the probit models were considered in the estimation of the determinants of the level of participation, namely the variable transaction costs. To find these, heckit models were applied, or, in other words, the second stage of the Heckman procedure. Tobit models were also estimated to account for both the decision to participate and the level of participation (or fixed and variable transaction costs).

Visits of extension officers, the size of the arable land, and the age of the head of the household increased the likelihood of households selling horticulture crop. The household size, the value of livestock owned and income from pensions reduced the likelihood of households selling horticultural crops. The size of arable land, proximity to the nearest town and non-farm earnings positively increased the level of participation in horticultural markets. The age of the head of the household, the household size, livestock ownership, road conditions, being educated, and earning a non-farm income negatively affected the level of horticultural sales. The results imply that factors alleviating transaction costs in horticultural markets have to do with access to information and to production assets, while a large-sized household and pensions exacerbated the costs. The age of the head of the household shows

ambiguous results; older farmers are more willing to sell in general, but younger farmers tend to sell more horticultural crops.

The likelihood of selling livestock was significantly decreased by the increase in household size and pension earnings. On the other hand, being a female head of the household, the value of livestock owned and proximity to nearest town increase the likelihood of selling livestock. An increase in livestock sales took place when the value of livestock increased, when the head of the household was female, when the area of arable land increased, when the household had access to good roads, and when it was located in relative close proximity to the nearest town with good access roads. An increase in the household size reduced the level of livestock sales. These findings provide a clearer pattern of factors responsible for transaction costs in livestock markets. Production assets and market accessibility, as well as a commercial objective to own more livestock tend to alleviate the transaction costs related to livestock marketing. An increase in the size of the household contributed to a growth in inhibiting transaction costs. The reason for this is that lengthy negotiations would be required involving each additional member of the household in order to come to a decision whether to sell some livestock.

The pattern of participation in the maize market is simple. There are basically only two factors influencing the maize market. Firstly, an increased size of the household tended to discourage selling of maize since there is a need to meet the consumption requirements of the household. Secondly, an increased area of the arable land stimulated participation in the market because this would allow for an increased production extending beyond the consumption requirements of the household. In other words, participation in the maize market depends on production and consumption factors. However, ownership of livestock positively increased the level of maize sales. It seems that owning livestock evens out the risk of loss of food security when selling maize.

Participation in the field crops market is slightly complicated by the heterogeneous nature of these crops. Some field crops, such as wheat and coriander, are commercialised, but others are not, such as grain sorghum. The findings show that

good road conditions and an increased area of arable land positively affected the sales of other field crops. However, the ownership of a vehicle or tractor, proximity to nearest town, non-farm earnings, and contacts with extension services discouraged sales of other field crops. These factors did, however, encourage market participation in other commodities.

6.2 CONCLUSIONS AND POLICY IMPLICATIONS

The conclusions and policy implications from the selectivity models are presented under the following headings: 'Access to information', 'Access to assets and endowments', 'Household size, age and gender effects', and 'Interactive effects'. Originally it was hypothesised that households with better access to information and possessing more endowments would be in a better position to participate in markets.

6.2.1 Access to information

Differential access to information is one of the major explanations for the existence of transaction costs. In this study access to information is proxied by the average education of the household, contact with extension services, proximity to and the road conditions to the nearest town. The first set of models (probit) compared households participating in one commodity market with those not participating at all. They sought to identify the effect of access to information on the decision to participate in markets, which would then be reflected in fixed transaction costs. Proximity to the nearest town stimulated horticultural sales, but discouraged a positive decision to participate in markets for other field crops. Proximity was not significant for decision to participate in livestock and maize market. Proximity is important for horticultural crops, though, since farmers need to make decisions about selling their produce timely. Another aspect is that a location closer to the markets facilitates access to information. Contact with extension officers also facilitated the decision to sell horticultural products, but did not do so for the other commodities. This implies that for households to participate in the horticulture market they need specialised advice (information). Good road conditions were only an important factor

in the decision to sell other field crops, but did not play that role with respect to other commodities. Average education does not influence the decision to participate in any of the markets.

These results suggest that farmers who are presently not participating in the markets might respond positively if they could have reasonable access to information about markets. Access to information is possible when farmers are located closer to the markets, and have appropriate contacts with the extension service. These conditions are particularly relevant for high value commodities such as horticultural crops (though limited in other commodities). Information systems for promoting market access have not been very clear and accessible in South Africa. To encourage smallholder farmers to participate in high value markets, it is definitely needed to create information sources that are within farmers' reach. It is pertinent that extension systems should be able to supply the farmers with adequate marketing information. Thus it is recommended that government, in particular, consider introducing into the extension system extension officers who are specialised in marketing. Naturally this would require the training of these officers through formal college education and in the in-service context. With extension officers gathering and dispersing market information the benefit of such investments would be an increased market participation of smallholder farmers.

Somehow, average education of the household appears unimportant as an information-gathering instrument for stimulating the decision to participate in markets. This may have two implications. Firstly, average education as considered in the study, assumes that all household members are involved in the decision making on market participation. In high value commodities, however, only one member of the household might be involved in marketing decisions due to its intensity. On reflection, it might have been useful to assess the role of the level of the individual household members' education in the marketing decision. Unfortunately, individual members' level of education could not be assessed for reason that there were not enough observations for that variable.

The second implication is the need to customise education and training to market access. This relates to the idea of making extension officers knowledgeable about marketing. These officers could then provide training to farmers about markets. Formal education would need to get involved in this and introduce topics relating to marketing management as elementary school subjects and as part of adult literacy and numeracy classes. Introducing such a focus fits well with the process of restructuring education to outcome-based education.

The other role of information pertains to the increased level of market participation. This is reflected in the existence of variable transaction costs. Proximity to the nearest town was statistically significant for increasing the level of participation in horticulture markets. In this respect it was also significant for increased participation in the markets for other field crops, but not for the livestock and maize markets. Good road conditions positively affected the sales of livestock, but negatively affected the sales of horticulture. The negative effect on horticulture sellers is attributable to the data gathered from the banana farmers in Homo near Giyani, in the Lowveld Region. The road conditions used by these farmers are relatively bad, yet they manage to market their crop, which is a high value crop. Good road conditions were also positive factors for marketing other field crops among sellers, but negative with respect to these crops when all households are considered. The road condition was not an important factor for maize sales. Contact with extension officers and average education were not statistically significant in affecting the levels of sales.

The heckit results suggest that information variables belong to the fixed transaction costs, which may not significantly affect the level of market participation. For example, contact with the extension service and education will not affect the level of sales. The role of access to information through extension officers and the ability to interpret information is limited to influencing the decision of farmers whether to participate in the market. What the farmer knows about the market is not pivotal in determining the level of sales. Other factors, such as location factors tend to be important in the determination of sales. For example, for every kilometre closer to the nearest town the level of horticultural sales increases by about R152. The

findings also indicate that some major contributing horticultural farmers are faced with very bad road conditions. An implication for policy making might be that investment in a good physical infrastructure is of the essence if smallholder participation in the markets is to be encouraged. Markets should be brought closer to the farmers in order to address the problem of proximity to markets. This can be done by establishing market infrastructure that includes collection points and/or a transport system. Farmers could so deliver their products to the nearby distribution points, from which the buyers or agents can collect the products. Possibly this initiative could be left in the hands of the private sector, but the public sector could play a role in supporting the information transfer to farmers. There is therefore a clear need for better managing of marketing, such that it can cater for market information centres.

6.2.2 Access to assets and endowment

The concept of access to assets is operationalised by five variables, namely size of arable land, value of livestock, ownership of transport equipment, non-farm income and pension earnings. Access to assets ameliorates transaction costs by making production possible; facilitate market information and carrying out, or investing in, the exchange. Some assets such as land is used to produce, vehicles are used to reach out to the market centres, and provide alternative and supplementary income from non-farm sources when transporting commodities to the market.

The size of arable land was a significantly positive factor in the probit models for horticulture, maize and other field crops, but not for livestock. On the other hand, as expected, the value of livestock is positively significant for the probability of selling livestock and negatively significant for the selling of horticulture. This was not significantly so for maize and other field crops. Access to non-farm income is a significantly negative factor for market participation in other field crops, and not significant for livestock and maize. Access to pensions was a significantly negative factor for participation in the livestock and horticulture market, but was not significant

for maize and other field crops. Ownership of vehicles and/or tractors was not a significant factor in influencing the probability of market participation.

The heckit models show that arable land is positively associated with sales value for livestock, horticulture and maize, but negative with the sales value of other field crops. The value of livestock is positively associated with the sales value for livestock and maize, but negatively for horticulture, and not significant for other field crops. Non-farm income was positively associated with horticulture sales, negatively with other field crops sales, and not significant for livestock and maize. Ownership of vehicle and tractor is significantly negatively associated with sales of other field crops, but is not significant with respect to other commodities. Access to pensions was not a significant factor in determining the value of sales.

The results suggest that farmers will not participate in the markets when they experience a lack of access to productive assets such as land and livestock, and a lack of precautionary assets such as non-farm income. These findings pose a challenge to the policy making process in South Africa, as this currently attempts to provide greater access to land and improve the conditions of earning a livelihood. At present the land reform process is not moving as fast as was expected. As the land reform process is being reviewed, greater consideration should be placed on mechanisms to fast-track this process and design it in such a way that it will motivate high value commodity production. Also, by increasing the area of grazing land and associated property rights smallholder livestock production could well improve. It is hoped that the Integrated Programme of Land Redistribution and Agricultural Development (ILRAD) will lead to such greater access to productive resources. The importance of non-farm income reflects the need for liquidity in market participation. Since not all farmers have access to non-farm income, it is pertinent to make provisions for credit as an alternative. Access to pensions provides an alternative livelihood strategy such that farmers have less need for cash through market participation. As a result pensions have a negative impact on market participation. The fact that ownership of a vehicle or tractor does not encourage decision to participate in the market implies that farmers may be using these assets mainly for other purposes, rather than for marketing activities.

6.2.3 Household size, age and gender effects

The structure of the household is broken down in the household size, and age and gender of the head of the household. The household size negatively affects the chance of participating in the markets for horticulture, livestock and maize, but positively in the market for other field crops. Age of the head of the household was a significantly positive factor for the likelihood to participate in the horticulture market, while being a female head of the household was a significantly positive factor for participation in the livestock market. Furthermore, the size of the household was significantly negatively related to the value of sales for all commodities. However, the size of household was positively related to maize sales for all observations (total effect). Being a female head of the household was positively related with livestock sales, while age of the head of the household was negatively related with levels of horticulture sales.

The results suggest that households generally participate in the markets when they have most of the members involved in production activities rather than being mere dependants. Female farmers generally participate in livestock markets more than male farmers do. Older farmers are more likely to participate in the horticulture market, but tend to sell significantly less compared to younger farmers. These findings bring to the fore the importance of a demographic policy which takes into account the composition of the households. For a commercialisation process to be successful it is pertinent to determine the role of different household members in household's market participation. For example, consideration should be made on how to make youth to contribute to market participation process (in contrast to being dependent). It appears that female farmers are more involved in livestock markets and less in horticulture markets. This shows the need to enhance opportunities for women to participate in livestock enterprises. Factors limiting the participation of women in horticultural enterprises should be identified and where possible removed. For example, the status of women as contractual partners should be elevated. Older farmers are normally experienced in market participation, but often they have to few

resources to handle large quantities of horticulture produce for the market. Programmes for market access should identify the needs of farmers from different age groups.

6.2.4 Interactive effects

Two interaction factors were included in the study to measure the reinforcing effects between two variables. These variables were the interaction of proximity to the nearest town with the road conditions to this town, and the average education with access to non-farm income. It was found that these interaction factors were not significant in determining the probability of market participation. The interaction of proximity and road conditions was, however, significantly positive with the level of livestock sales. The interaction of education and non-farm income was negatively associated with the sales of horticultural crops.

The findings suggest that livestock farmers would be willing to sell more livestock when markets are closer by with good road conditions to reach them. That is, where roads are good, for every kilometre closer to the market the value of livestock sales increases by R46 among livestock sellers. This is the case in situations where the buyers collect the livestock themselves. This conclusion reinforces the need for an appropriate market infrastructure if market access is to be enhanced. This would involve the establishment of collection points as well as investment in the physical infrastructure, the roads. The results further suggest that educated households receiving non-farm income will normally participate less in markets. Such households would either have other, and possibly more, responsibilities, or they have enough income to substitute the need for participation in high value markets.

6.3 GENERAL POLICY IMPLICATIONS

6.3.1 General overview

This study has provided primarily two types of information pertaining to market participation behaviour of smallholder farmers in the Northern Province (South Africa). The first type of information identified factors contributing to fixed transaction costs, which determine whether the household will participate in the market for each of the four commodities produced by the smallholder farmers in the province. The second type of information identified factors contributing to variable transaction costs, which determine the level of market participation in these commodities.

Smallholders in the Northern Province produce a range of products, but only half of the households in the sample participate in markets. Some households are involved in high value commodities such as horticulture and livestock, but only about 19 and 17% of the households participate in markets. These households have a foothold in the process of market participation. Other households are involved in food crops such as maize, and other field crops, but only about 20 and 21% of the households sell maize and other field crops respectively. These relatively low participation rates are a reflection of the existence of transaction costs.

Transaction costs are reflected in the differential access to assets and information asymmetries as a result of different household characteristics and location factors. The results of the two-stage selectivity model suggested that these factors are important in the market participation behaviour of smallholder farmers. As expected, households who had better access to information through contacts with extension services and proximity to markets showed a positive tendency to participate in the markets. The level of education of the household did not make any difference in marketing behaviour. The reason for this could be ascribed to the fact that formal training and education in South Africa does not cater for entrepreneurship. Similarly, access to assets stimulated households to participate in the markets.

Surprisingly, ownership of a vehicle and/or a tractor did not make any positive difference in the participation behaviour. Seemingly, these assets are used in other activities rather employ them for the marketing process. The household structure reflecting particular risk behaviour provided the expected pattern. For example, the household size negatively affected participation in markets since every additional member exacerbates the pressure of risk in market failures.

Being a female head of the household tended to be associated with participation in livestock markets, while most of male household heads were involved in horticulture markets. Three possible explanations could be that women prefer to sell most of their livestock, mainly small stock and poultry, while men prefer to keep it, that is large stock, as a store of wealth and social status. Secondly, horticultural production requires access to irrigated land. Here female farmers may have a problem of access since policies on land and water are still biased against women. Thirdly, livestock markets are generally more stable than the horticulture market system, which requires high risk taking. As such, it is easier for women to participate in livestock market than horticulture market. The age of the head of the household seemed to give inconclusive results pertaining to market participation behaviour.

Next we will discuss some policy and strategy recommendations as suggested by these findings.

6.3.2 Policy recommendations

Due to the way variables have been defined in this study the policy recommendations discussed below must be viewed with some caution. For example, variables such as arable land and livestock indicated the size of the asset owned. The study does not explore why some farmers would have less land (or livestock) and others have more. Were some farmers restricted in one way or another to access such assets? The policy recommendations proposed below presume that some farmers are restricted to asset access.

The policy required to stimulate market participation needs to be tailored to the requirements for participation of the four categories of commodities. It must also formulate and implement measures to remove fixed transaction costs and reduce the variable transaction costs. The horticulture farmers are generally market oriented, but for them to be in a position to cross the threshold inhibiting participation in horticulture markets, they require access to irrigated land and extension service to identify market information. Improving participation in horticultural markets should take account of women's constraints to access these markets. In order to improve the level of participation in horticulture would require better access to production facilities such as land, credit and other appropriate inputs for increased production. Furthermore, facilities such as transport networks, including more accessible roads and vehicles, would ease the problem of access to horticultural markets. Horticulture as a perishable commodity requires fast access to markets and thus the distance needs to be reduced and the infrastructure needs to be improved. This study has shown that some horticultural farmers continue to sell considerable quantities even though they face poor road conditions. Indeed these farmers could participate more and more effectively if they are served with a better infrastructure.

Since livestock is also a high value commodity, participation in the livestock market requires similar policy measures as horticulture does. There are, however, other special features needed in a program catering for livestock market participants. For example, to overcome fixed transaction costs livestock farmers require better access to grazing land and up to date training in the workings of the livestock marketing system. This would be a task for the extension service. The extension service should further be reoriented from a mainly technical focus to one that focuses on serving the marketing needs for livestock owners. To increase the level of participation in livestock markets farmers require better access to grazing land as well as an improved marketing infrastructure.

Those households selling maize and other field crops are normally viewed as not very commercially oriented since these are food crops. The primary policy objective is to use these commodities as a strategy to food security. The farmers' decision to

participate in the market is normally driven by the availability of surplus produce. Policy efforts should enhance the production capacity through the provision of land. Another factor is that for market participation it should be possible for these commodities to be stored until better market conditions prevail. In other words, the development of storage facilities or processing technology would make a big difference in the economics of the marketing behaviour of these farmers. Such developments can provide great opportunities for private sector development in the rural areas.

Based on the policy measures suggested above and specifically pertaining to farmers in the Northern Province, a marketing strategy could be developed for the other smallholder farmers in South Africa. Part of this **marketing strategy** to improve market access for smallholders would entail the following:

- **The development of an information system** involving market search, prices, and transaction conditions. The system should address questions of who requires information, what type of information, how, by whom and when should the information be made available. Agricultural Marketing Officers (extension officers), who can link with the market information centres at district or service centre level, could facilitate this. These officers can also assist in the application of print and electronic media to provide digestible market information. The link between extension services and farmers could be enhanced by improving the farmers' access to and the use of cellular phones. This could be instrumental for farmers to contact information centres. Farmers could be supported in this by providing them with better cellular reception and/or negotiating on their behalf for a discounted price of the cellular phone and subscription rates. Access to this system should make a farmer into an informed decision-maker.

- **An adequate and appropriate transport system** is a prerequisite to transactions. Transport is related to the distance to the markets, the

conditions of the roads, and transport facilities such as vehicles and tractors. A well thought out transport strategy should address what is being transported, by whom, with what and where to. This strategy should cater for the emergence of transport contractors, the opening of road networks, the development of collection points, and investment in road infrastructure. As such the role of both public and private sector is imminent here. The government should open new roads and ensure the maintenance of existing ones. Members of local communities should be encouraged to provide transport services to ferry products to market centres or collection points.

- **Asset accumulation** will enable production and marketing of commodities. Policy guidelines encouraging appropriate procedures to acquire, own and transfer production assets are called for. Different assets tend to have different procedures. For example, livestock and vehicles are easily handled by private procedures without government intervention. However, government should streamline livestock policies to allow better access to smallholder farmers. This may further hinge on access to grazing land. Thus, government should clarify its programs on land access, which encompass ownership rights. For example, land reform should address both acquisition and ownership rights of land by smallholder farmers. Guidelines should be made clear as how such acquisition should take place. ILRAD should clarify alternative means of farmers getting access to land.

- **Marketing institutions** involve marketing organisations and marketing rules and systems. Marketing institutions should promote diversity in market access in order to provide farmers with options and alternative marketing channels. Farmers should have access to a directory of marketing channels and organisations as well as conditions and rules pertaining to marketing. Existing or new co-operatives should be encouraged to provide marketing services. Local co-operatives could serve as collection points for farmers' products.

- Other elements include **short courses** to train farmers in marketing management and the interpretation of market information. Also the development of **financial support (credit) system** for marketing activities is important. This involves extending credit to farmers when they need to send or transport their produce to the markets. This is a variant on the traditional production credit, but it provides much better repayments possibilities since the credit is used to finance the product that is actually and tangibly there.

6.4 RECOMMENDATIONS FOR FURTHER RESEARCH

The main objective of the study was to determine the role of transaction costs factors influencing the participation of smallholder farming systems in output markets in Northern Province. The main goal was to contribute to the knowledge base regarding economic development based on the encouragement of market participation by smallholder farmers. The study suggests some ways to assist the further examination of market participation issues.

The study concluded that improving access to information by contacts with extension services and proximity to markets, promoting of access to assets such as land, livestock, and non-farm income, as well as targeting specific age and gender groups of farmers, and improving road conditions will stimulate market participation of smallholder farmers. Several pertinent issues were not covered in this study and thus require additional investigation. For example, it is not so clear what kind of information system would work best for the Northern Province Department of Agriculture to encourage market participation. In this regard, the location and design of information institutions should be some of the concerns facing policy makers. Improved access to assets as a major factor in overcoming variable transaction costs was shown to improve the level of market participation. Packaging such assets to stimulate market participation is another policy issue that requires further investigation.

The study also shows that households who have access to non-farm income, which can be invested in transactions, tend to sell more horticulture commodities. However, it is not established in the study as to what factors encourage farmers and their household members to be involved in non-farm activities. Related to this is that there seems to be simultaneity between the set of transaction cost factors and non-farm income activities. It might be interesting to examine how non-farm factors and transaction costs factors are related to non-farm and other issues of market participation.

Furthermore, the study has shown that access to land stimulates participation in markets. In the study, arable land was defined as the size of land owned. The measurement did not take into account land quality and tenure systems. It is suspected that the condition of the land may have different effects on different commodities. It follows that it might be useful for future research to determine the role of tenure systems and land quality in ameliorating the transaction costs for market participation.

Other factors such as education and ownership of a tractor and/or vehicle were generally not showing significance for market participation. This is probably caused by the way the variables are measured. In this study, the education indicator was based on average education of the household, which included household members not involved in farming. Presumably that the education of the head of the household and the second responsible member could play a major role in information access. Similarly, in this study it was not ascertained whether the tractor or vehicle was used specifically for market participation. In future studies, a variable reflecting whether the vehicle or tractor is used for market participation would be useful. In addition, a transportation index may be constructed to reflect the level and pattern of access to transport for marketing purposes.

There are other issues not addressed in this study that could be interesting to investigate. These include the role that livestock and horticulture play in securing the livelihood of the poor. And the question would be why women keep and/ or sell

more livestock than men? What can be done to help men so that they will sell more small livestock, or the women so that they will sell more large stock? Furthermore, the interaction between non-farm income earning and the existence of transaction costs and liquidity constraints on farm output are well-worn but still important issues that could profitably be investigated in a study addressing income sources.

In the spirit of the previous paragraphs, it must be stated that the study has made an attempt to measure factors affecting (or as proxies of) the transaction costs in market participation. Some direct measurement of transaction costs may be pertinent although most of the direct transaction costs would create an endogeneity problem in the market participation model. It could be shown, however, how the various factors affect direct transaction costs.

This study is based on a 1997 (synchronic) survey, and the farmers' behaviour over time (diachronic) was not taken into account. Market participation, however, is a dynamic behaviour, which reflects change in farmers' behaviour over time. For example, when farmers are exposed to low transaction costs or can see the advantages of market participation, they are likely to participate more in the markets. The data collected and the manner in which they were gathered are not sufficient to substantiate this hypothesis. It would be interesting to examine how the same farmers used as informants in this study differ in market participation behaviour in the next five or six years. Some issues to pursue would be whether farmers not participating at present are participating then, whether farmers from one group (say maize sellers) move to another group (such as horticulture or livestock sellers). A related issue would be whether the levels of sales are changing or not. Another focus of interest could be to identify transaction costs factors explaining differential market participation over time.

The study also attempted to disaggregate the commodities. Only maize was specified into a single commodity. Others such as horticulture, livestock and other field crops were treated as aggregated commodities. As such, it is not clear whether the role of gender in livestock market participation pertains to a particular livestock category or whether these gender effects are more generally significant. Another

issue for investigation could be whether the different horticulture commodities face different transaction costs. For example, access to a vegetables market might differ from that to a fruit market. Therefore one recommendation for future study is to look at these issues by using disaggregated data.

Further, the study has approached the marketing process from an individual farmer perspective. In practice, some farmers may market their produce collectively, which would affect the transaction costs differently. In this study, collective action of farmers was considered with an indicator of whether a household was a member of a group. This indicator seemed to capture too many aspects hence it was correlated with other factors. Perhaps for future research, a more refined indicator of collective versus individual mark access should be considered.

The findings of this study are specifically relevant to the Northern Province's smallholder farmers. The agricultural setting of the Northern Province may differ from other areas in South Africa, from Africa and from other developing countries. The smallholder farmers, as a group, however, tend to face similar constraints for participation in mainstream agriculture markets. It is possible, though, to generalise these results for areas elsewhere, but it requires some adjustments for the local agricultural settings. Thus generalised policy guidelines for a smaller or larger, even international, region can be recommended. Such a multi-country view will be important:

(i) for national agricultural policy makers in order to understand the limitations related to strategies from other countries,

(ii) for donor agencies in order to effectively allocate limited aid funds to targeted projects, and

(iii) for international agricultural research centres in order to understand the constraints operating on market participation across national or regional boundaries. This would assist in tailoring research designs focusing on the promotion of market participation that suit local needs.

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APPENDIX ONE

SOME DESCRIPTIVE STATISTICS

Appendix 1.1: Descriptive statistics

Sample statistics of market participation

Variable Description	Sample Mean	Std Dev	Min	Max
Selling maize (%)	26	0.44	0	1
Selling livestock (%)	17	0.38	0	1
Selling horticultural crops (%)	19	0.39	0	1
Selling other field crops (%)	21	0.41	0	1
Selling any agricultural commodity (%)	50	0.50	0	1
Value of maize sold (R)	274	787	0	6320
Percentage of maize sold (%)				
Value of livestock sold (R)	492	2036	0	16000
Value of horticulture sold (R)	1663	7361	0	60000
Value of other field crops sold (R)	459	1216	0	7000
Aggregate Value of farm output sold (R)				

Sample statistics of consumption

Variable Description	Sample Mean	Std Dev	Min	Max
Maize consumed (# of 80kg bags)	3.08	5.75	0	37
Maize exchanges for maize meal (# of bags)	7.12	10.79	0	70
Value of livestock consumed (R)	177	565	0	4000
Value of other crops consumed (R)	142	307	0	1600

Appendix 1.1. (cont.)

Sample Statistics of Explanatory variables

Variable Description	Sample Mean	Std Dev	Min	Max
Value of livestock owned (in R100)	63.418	140	0	910
Pensions earned (R)	3599	4039	0	15480
Salary and wages earned (R)	3599	4039	0	15480
Income from business activities (R)	1523	5750	0	40000
1 if household head is female	0.27	0.45	0	1
Age of household head (years)	57.57	11.55	31	82
Age of head less mean age (years)	-1.13	13.96	-57.57	24.43
Age deviation squared	195	466	0.18	3314
Household size in adult equivalent	4.91	1.97	1.5	16.30
Average education of the household (yrs)	7.49	2.13	2.17	15.17
Average education less mean education (years)	-0.10	2.28	-7.49	7.68
Square of average education deviations	5.20	9.70	0	58.91
Size of arable land (ha)	3.11	3.68	0	27.5
1 if owning a tractor or vehicle	0.17	0.38	0	1
Distance to nearest (regional) town	-27	12.64	-60	-6
1 if road conditions to nearest town are good	0.32	0.47	0	1
1 if farming was learned through extension visits	0.71	0.46	0	1
Interaction of proximity and road conditions to nearest town	-6.85	12.01	-45	0
Interaction between education and salary/wage earnings	199	113	0	518
Interaction between arable land and ownership of tractor/vehicle	0.98	2.97	0	20

Appendix 1.2: Cross Tabulation for Participants in different Commodities

Number of households selling and not selling horticulture and livestock

		Livestock		
		Not sell	Sell	Total
Horticulture	Not sell	104	24	128
	Sell	26	3	29
	Total	130	27	157

% of households selling and not selling horticulture and livestock

		Livestock		
		Not sell	Sell	Total
Horticulture	Not sell	81.3	18.8	100
	Sell	89.7	10.3	100
	Total within horticulture	82.8	17.2	100

Number of households selling and not selling horticulture and other filed crops

		Other field crops		
		Not sell	Sell	Total
Horticulture	Not sell	107	21	128
	Sell	17	12	29
	Total	124	33	157

% of households selling and not selling horticulture and other field crops

		Other field crops		
		Not sell	Sell	Total
Horticulture	Not sell	83.6	16.4	100
	Sell	58.6	41.4	100
	Total within horticulture	79	21	100

Appendix 1.2 (cont.)

Number of households selling and not selling horticulture and maize

		Maize		
		Not sell	Sell	Total
Horticulture	Not sell	109	19	128
	Sell	16	13	29
	Total	125	32	157

% of households selling and not selling horticulture and maize

		Maize		
		Not sell	Sell	Total
Horticulture	Not sell	85.2	14.8	100
	Sell	55.2	44.8	100
	Total % within horticulture	79.6	20.4	100

Number of households selling and not selling livestock and other field crops

		Other field crops		
		Not sell	Sell	Total
Livestock	Not sell	103	27	130
	Sell	21	6	27
	Total	124	33	157

% of households selling and not selling livestock and other field crops

		Other filed crops		
		Not sell	Sell	Total
Livestock	Not sell	79.2	20.8	100
	Sell	77.8	22.2	100
	Total % within horticulture	79.0	21.0	100

Appendix 1.2 (cont.)

Number of households selling and not selling livestock and maize

		Maize		
		Not sell	Sell	Total
Livestock	Not sell	106	24	130
	Sell	19	8	27
	Total	125	32	157

% of households selling and not selling livestock and maize

		Maize		
		Not sell	Sell	Total
Livestock	Not sell	81.5	18.5	100
	Sell	70.4	29.6	100
	Total % within livestock	79.6	20.4	100

Number of households selling and not selling other field crops and maize

		Maize		
		Not sell	Sell	Total
Other field crops	Not sell	105	19	124
	Sell	20	13	33
	Total	125	32	157

% of households selling and not selling other field crops and maize

		Maize		
		Not sell	Sell	Total
Other field crops	Not sell	84.7	15.3	100
	Sell	60.6	39.6	100
	Total % within other field crops	79.6	20.4	100

Appendix 1.3: Mean comparison of household groups of participation

Mean Comparison For Participants And Non-Participants in Markets

Variable Description	Horticulture N=29	Livestock N=27	Maize N=32	Other F-crops N=33	Not Seller N=78
Selling maize (%)	45	30		39	0.0
Selling livestock (%)	10		25	18	0.0
Selling horticultural crops (%)		11	41	36	0.0
Selling other field crops	41	22	41		0.0
Mean value of maize sold (R)	538	633		457	0
Mean value of livestock sold (R)	686	2861	1038	185	0.0
Mean value of horticulture sold (R)	9005	68	1978	1498	0.0
Mean value of other field crops sold (R)	899	198	875	2182	0

Comparing production and consumption among households

Variable Description	Horticulture N=	Livestock N=	Maize N=32	Other F-crops	Not Seller N=78
Maize produce (# of 80kg bags)	17.69	16.70	31.47	15.91	9.46
Maize consumed (# of 80 kg bags)	3.21	2.85	4.53	2.58	3.41
Maize processed – miller/coop	7.07	6.00	9.59	6.97	6.12
Maize producer price (R / bag)	69.17	65.00	76.38	62.36	60.49
Maize purchase price (R / bag)	129	121	123.34	127	126
Livestock consumed (R)	104	571	315.31	200	73
Other crops consumed (R)	302	571	134	332	69.87

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

Appendix 1.3 (Cont..)

Comparing explanatory variables among households groups

Variable Description	Horticulture	Livestock	Maize	Other F-crops	Not Seller
Value of livestock (in R100)	36.40	171	71.51	57.58	50.860
Pensions earned (R)	2386	1720	3452	3335	4162
Salary and wages earned (R)	9937	5978	10623	5115	9539
Income from business (R)	1759	6144	3366	2206	660
Household head is female (%)	14	44	19	21	27
Age of household head (years)	57	54.89	55.97	58.25	58.15
Household size AE	4.56	4.57	4.11	4.93	5.11
Average hh education (yrs)	7.81	7.72	7.65	7.87	7.34
Size of arable land (ha)	6.49	3.95	5.25	3.66	1.83
Ownership of tractor / vehicle (%)	31	26	31	15	9
Distance to nearest town	-23.03	-26.11	-24	-28.76	-28.86
Road conditions to nearest town are good (%)	62	26	50	67	17
Farming was learned through extension visits (%)	76	63	66	70	76
Interaction of proximity and road conditions to nearest town	-13.83	-5.19	-9.56	-16.61	-3.26
Interaction between education and salary/wage earnings	95880	49407	122293	56626	79776
Interaction between arable land and ownership of tractor/vehicle	2.83	1.89	2.87	0.99	0.14

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

APPENDIX TWO

TOBIT MODELS FOR MARKET PARTICIPATION

Table A-2.1: Tobit and OLS results for market participation in horticulture

Variable Description	MLE	Marginal Effects	OLS
Constant	-17164 (18204)	-1257.2 (1359.0)	5538.6 (4552.6)
Household Assets			
• Size of arable land (ha)	2856.2*** (520.29)	209.21*** (78.196)	1054.2*** (160.99)
• Value of livestock (in R100)	-49.128* (28.454)	-3.5984 (2.2790)	-8.8769* (4.8762)
• Pensions earned (R)	-1.6375** (0.7815)	-0.1199* (0.0662)	-0.2195 (0.1961)
• Non-farm earnings (R)	27.324 (34.915)	2.0013 (2.6551)	24.690** (11.432)
• 1 if owning a tractor or vehicle	929.40 (5245.5)	68.074 (383.67)	-1046.3 (1674.4)
Access to Information			
• 1 if farming was learned through extension visits	9906.0* (5233.2)	725.57* (419.08)	1201.7 (1320.9)
• Average hh education (yrs)	263.82 (1247.7)	19.323 (91.283)	188.34 (314.52)
• Distance to nearest town	554.26 (269.82)	40.597 (22.994)	152.21** (60.546)
• 1 if road conditions to nearest town are good	-7604.3 (10083)	-556.98 (770.33)	-4926.5 (2830.3)
Household Characteristics			
• 1 if household head is female	-14769** (6558.6)	-1081.8** (478.22)	-1209.1 (1350.7)
• Age of household head (years)	249.05 (269.45)	18.242 (20.489)	-19.655 (68.475)
• Household size AE	-1924.6** (921.12)	-140.97* (79.180)	-479.76 (307.17)
Interaction Factors			
• Interaction of proximity and road conditions to nearest town	-563.51 (380.97)	-41.274 (30.214)	-121.16 (103.70)
• Interaction between education and salary/wage earnings	-3.4387 (3.3420)	-0.2519 (0.2586)	-2.1042 (1.0603)
SIGMA	13259 (1929.3)		
Φ	0.073		
R-SQ			0.38
ADJ R-RQ			0.32
F-TEST			5.49***

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

Table A-2.2: Tobit and OLS results for market participation in livestock

	MLE	Marginal Effects	OLS
Constant	-6223.9 (3925.2)	-580.59 (385.21)	-585.29 (1168.3)
Household Assets			
• Size of arable land (ha)	131.31 (106.08)	12.249 (10.745)	123.81*** (41.314)
• Value of livestock (in R100)	19.757*** (3.502)	1.8430*** (0.5873)	8.5362*** (1.2513)
• Pensions earned (R)	-0.4562** (0.2128)	-0.0426** (0.0199)	-0.0475 (0.0503)
• Non-farm earnings (R)	9.1567 (10.848)	0.8542 (1.0270)	2.3699 (2.9336)
• 1 if owning a tractor or vehicle	496.11 (1319.6)	46.279 (124.33)	351.47 (429.69)
Access to Information			
• 1 if farming was learned through extension visits	-1420.4 (995.46)	-132.50 (96.232)	-329.39 (338.97)
• Average hh education (yrs)	231.22 (275.46)	21.569 (26.186)	61.386 (80.712)
• Distance to nearest town	57.803 (47.290)	5.3920 (4.5957)	10.113 (15.537)
• 1 if road conditions to nearest town are good	4045.0 (2280.2)	377.33* (226.51)	1343.7* (726.32)
Household Characteristics			
• 1 if household head is female	3228.6*** (1040.8)	301.17** (121.78)	852.82** (346.61)
• Age of household head (years)	100.57* (61.569)	9.3811* (5.8557)	11.966 (17.572)
• Household size AE	-736.34** (336.70)	-68.688** (32.742)	-120.38 (78.825)
Interaction Factor			
• Interaction of proximity and road conditions to nearest town	220.77** (93.944)	20.594** (9.5154)	46.349* (26.613)
• Interaction between education and salary/wage earnings	-1.0786 (1.066)	-0.1006 (0.1016)	-0.3005 (0.2721)
SIGMA	3273.7*** (482.78)		
Φ	0.093		
R-SQ			0.47
ADJ R-RQ			0.41
F-TEST			7.77***

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

Table A-2.3: Tobit and OLS results for market participation in maize

Variable Description	MLE	Marginal Effects	OLS
Constant	234.18 (2141.6)	40.281 (368.26)	594.78 (539.84)
Household Assets			
• Size of arable land (ha)	149.12** (64.094)	25.649** (11.481)	51.513*** (19.091)
• Value of livestock (in R100)	3.3399* (1.9374)	0.5745* (0.3370)	1.5625*** (0.5782)
• Pensions earned (R)	0.0206 (0.0856)	0.0035 (0.0147)	0.0146 (0.0233)
• Non-farm earnings (R)	-5.8524 (5.5583)	-1.0067 (0.9482)	-1.0794 (1.3555)
• 1 if owning a tractor or vehicle	664.45 (688.28)	114.29 (119.04)	216.97 (198.55)
Access to Information			
• 1 if farming was learned through extension visits	261.48 (573.67)	44.977 (99.065)	147.01 (156.63)
• Average hh education (yrs)	-19.758 (141.64)	-3.3986 (24.348)	9.6355 (37.295)
• Distance to nearest town	9.6586 (30.008)	1.6614 (5.1588)	2.2424 (7.1795)
• 1 if road conditions to nearest town are good	733.19 (1281.7)	126.12 (220.79)	167.94 (335.62)
Household Characteristics			
• 1 if household head is female	-383.25 (644.54)	-65.922 (111.26)	-152.20 (160.16)
• Age of household head (years)	-8.0810 (28.970)	-1.3900 (4.9832)	-6.3486 (8.1197)
• Household size AE	-475.57*** (176.83)	-81.802 (28.359)	-76.947** (36.424)
Interaction Factors			
• Interaction of proximity and road conditions to nearest town	3.5867 (47.257)	0.6169 (8.1322)	4.2296 (12.297)
• Interaction between education and salary/wage earnings	0.5321 (0.4677)	0.0915 (0.0799)	0.1027 (0.1257)
SIGMA	1983.15*** (292.37)		
Φ	0.17		
R-SQ			23
ADJ R-RQ			14
F-TEST			2.62***

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

Table A2.4: Tobit and OLS results for market participation in other field crops

	MLE	Marginal	OLS
Constant	-9054.9***	-1252.53***	-273.51
	(3264.7)	(424.62)	(775.82)
Household Assets			
• Size of arable land (ha)	200.84**	27.782**	28.399
	(101.41)	(14.043)	(27.435)
• Value of livestock (in R100)	0.8425	0.1165	-0.3111
	(2.4459)	(0.3362)	(0.8310)
• Pensions earned (R)	0.0040	0.0006	-0.0087
	(0.1081)	(0.0150)	(0.0334)
• Non-farm earnings (R)	-25.182***	-3.4833***	-5.3944***
	(9.2507)	(1.3499)	(1.9481)
• 1 if owning a tractor or vehicle	-2123.01**	-293.67*	-443.84
	(1076.36)	(150.99)	(285.34)
Access to Information			
• 1 if farming was learned through extension visits	-195.57	-27.053	-292.53
	(767.55)	(106.75)	(225.10)
• Average hh education (yrs)	77.901	10.776	42.714
	(188.76)	(26.477)	(53.598)
• Distance to nearest town	-122.28**	-16.915***	-8.2313
	(53.087)	(6.4535)	(10.318)
• 1 if road conditions to nearest town are good	5959.6***	824.36***	921.57
	(2194.8)	(277.01)	(482.32)
Household Characteristics			
• 1 if household head is female	-582.62	-80.594	-195.20
	(827.33)	(114.73)	(230.17)
• Age of household head (years)	5.8163	0.8046	4.5148
	(37.6605)	(5.2172)	(11.669)
• Household size AE	307.56*	42.543*	4.1871
	(178.32)	(23.901)	(52.345)
Interaction Factors			
• Interaction of proximity and road conditions to nearest town	47.388	6.5550	-13.796
	(65.244)	(8.6215)	(17.673)
• Interaction between education and salary/wage earnings	1.8152**	0.2511**	0.4450
	(0.7468)	(0.1080)	(0.1807)
SIGMA	2480.7***		
	(347.78)		
Φ	0.073		
R-SQ			33
ADJ R-RQ			25
F-TEST			4.28

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