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Determinants of participation of smallholder farmers in the marketing of small grains and strategies for improving their participation in the Limpopo River Basin of Zimbabwe

by

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To my loving husband, Behluli Moyo, beloved daughter, Nokunqoba Blessing Moyo, and   to my parents, who have always given me moral support to study.

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ABSTRACT

This thesis identifies determinants of market participation of smallholder sorghum and millet farmers and proposes strategies for improving their market participation. The study used survey data from 195 smallholder communal and resettled farmers, and agribusiness firms dealing with sorghum and millet. The farmers were selected from three sorghum and millet producing districts of Zimbabwe. The firms were located in Bulawayo and Harare. Data was collected through face-to-face interviews with the sampled farmers and firm representatives. The thesis also explores the way the small grains have been marketed and the extent of field crop contracting in Zimbabwe. In addition, literature on determinants of market participation for other commodities was reviewed. Recommendations were then drawn on strategies for improved market participation for smallholder farmers.

Transaction cost related factors are an important component of marketing that determines the extent of market participation for smallholder farmers. Results of the multiple regression and the probit models showed that transaction cost related factors, such as previously agreed prices (PRICEAGREE), confidence and trust in the buyer (CONFIDENCE), the difference in price knowledge (PRICEKNOW) and delayed payment for sold grain (DELAYPAY) have a significant impact on the quantity of grain sold and the extent of smallholder farmer participation in the market.

Discriminant analysis was used to identify factors discriminating sorghum and millet sellers and non-sellers. The division was made according to whether or not a household sold sorghum and/or

millet during the period 2004/05 to 2006/07. Of the fourteen potential discriminating variables, six explained group differences with statistical significance. The six important variables in the discriminant function analysis were: number of donkeys owned by a household, crop production levels, source of household income, method of transporting grain to the market, district and area cultivated. Five of the six discriminating variables point to wealth-ranking factors (household asset endowments) implying that poorer households are unable to participate in markets effectively.

Farmers identified issues that need to be addressed for sorghum and millet production and marketing to be improved. The identified issues offer guidelines for priority areas to focus on when addressing limitations that are currently inhibiting farmer market participation. The major issues which included; seed unavailability, lack of access to draft power, lack of access to fertilizer, establishment of irrigation schemes; provision of transport to the market, production of marketable surplus and establishing a local market, all point to the need for external assistance to farmers. A review of literature confirms that contracting is an effective way to coordinate and promote production and marketing in agriculture. Sorghum and millet can be grown under contract successfully. The presence of successful contracts for other commodity crops is an indicator of the potential to increase marketing of sorghum and millet through contracting. However, for contracting to succeed, it is necessary to improve sorghum and millet productivity with an assured quality of the grain.

The conclusion is that small grains are important food crops for smallholder farmers in drier environments but their productivity is low. Hence, to enhance farmer access to markets, it is necessary to increase the productivity of sorghum and millet and thus, enable smallholder farmers to produce adequate marketable surplus. Interventions by government and private sector should aim at addressing the major factors that determine market participation. Important to note is that, if poorer households are unable to effectively participate in markets, then interventions to increase households' productive assets or the public goods that support agricultural production and marketing may be necessary.

Based on the study findings, the thesis proposes possible key intervention ingredients for successful contracting of sorghum and millet in Zimbabwe. An enabling environment and legal

framework created by government and private sector, addressing identified priority areas, primarily will largely determine the level of market participation of smallholder farmers in Zimbabwe.

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ACRONYMS

AGRITEX	Agricultural Technical and Extension Service
AMA	Agricultural Marketing Authority
CBOs	Community based organizations
CEEPA	Centre for Environmental Economics and Policy in Africa
COTTCO	Cotton Company of Zimbabwe
CPWF	Challenge Programme on Water and Food
CPWFP1	Challenge Programme on Water and Food Project 1
CRS	Catholic Relief Services
C-SAFE	Consortium for Southern Africa Food Security Emergency
CSO	Central Statistical Office
DTC	Development Technology Centre
FAO	Food and Agriculture Organization of the United Nations
FMD	Foot and Mouth Disease
GMB	Grain Marketing Board
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IDRC	International Development Research Centre
IOFs	Investor-owned firms
LEAF	Livelihoods, Empowerment and Agroforestry
MAP	Market Assistance Programme
MSEs	Micro-small enterprises
NEPAD	New Partnership for Africa's Development
NERP	National Economic Revival Programme
NGOs	Non-governmental Organizations
SADC	Southern African Development Community
SAAKTI	Sustainable Access to Agroforestry Knowledge, Technology and Information
SDDP	Smallholder Dairy Development Project
SPSS	Statistical Package for Social Scientists
WFP	World Food Programme
ZIMACE	Zimbabwe Agricultural Commodity Exchange

CHAPTER 1

INTRODUCTION

1.1 Background information

Sorghum and millet account for 23 percent of the cereal production of the Southern African Development Community (SADC) countries. However, they are dominant grain crops only in Botswana and Namibia, where they constitute 86 percent and 50 percent of total cereal production, respectively (FAO, 1995). These small grains grow in harsh environments where other crops grow or yield poorly. In southern Africa, they are grown with limited water resources by a multitude of rural smallholder farmers, usually without the application of major inputs like fertilizers (Chisi *et al.*, 1997). Sorghum and millet, being drought tolerant, have an adaptive advantage and lower risk of failure than other cereals in such environments. With the exception of a few countries such as Sudan, these crops are consumed by disadvantaged groups and hence the reason for being referred to as "poor people's crops". Sorghum and millet are not generally traded in international markets or even in local markets in many countries. Therefore, smallholder farmers seldom have an assured market in the event of surplus production.

Small grains have been important staples in the semi-arid tropics of Africa and Asia for centuries. These crops have traditionally provided food, employment, and income for a substantial portion of the population, particularly smallholder producers. They will continue to be major food crops in Africa, particularly in Nigeria and Sudan, which together account for about 63 percent of Africa's sorghum production (Tariq & Sawandi, 2003). Though small grains have good potential for domestic and industrial uses, they have to compete with maize. There is, therefore, a need to look into the possibilities of alternative uses besides being used for traditional as well as novel foods.

1.1.1 Zimbabwe's agricultural sector[1]

Zimbabwe has a well-developed and diversified agricultural sector, producing food crops, cash crops and livestock. Agriculture is the mainstay of the country's economy and a major determinant of its growth. The country produces much of its own food, except in years where drought affects crop production. However, the capacity to produce sufficient food has diminished in the past decade as a consequence of the country's economic contraction and the fast-track land reform program. The staple food crop is maize and other important cereal crops include sorghum, millet, barley and/ wheat. Smallholder production's share of agricultural output rose from nine percent in 1983 to 50 percent in 1990, in spite of the high concentration of arable farmland in the commercial sector (Encyclopaedia of the nations, 2009). Agriculture provides employment and livelihoods for about 70 percent of the population, including 30 percent of formal employment. The agricultural sector contributes about 17 percent to the country's GDP and accounts for 40 to 50 percent of the country's total export revenues (Richardson, 2007).

Agriculture is dominated by the smallholder farming sector, with more than one million smallholder farmers and less than five thousand large scale farmers (Masanganise, 2002). About 75 percent of Zimbabwe's population live in the rural smallholder farming sector and depend on agriculture for their livelihoods (De Wit, 2006). The smallholder sector is characterized by diversified crops and livestock farming. Specialization of commodities is minimal. Food crops are grown alongside cash crops, particularly in high rainfall areas. The crops grown by smallholder farmers can be grouped as follows: plantation crops (sugar cane, coffee, tea), horticultural crops (fruits and vegetables), and field crops (maize, wheat, cotton, sunflower, sorghum, millets, groundnuts, cowpeas, sugar beans). Livestock is categorized into the following three major areas of production: beef, dairy and small stock (e.g. poultry, goats, sheep and pigs).

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[1] It is important to note that this thesis does not attempt to analyze the impact of the current economic and political crisis on the agricultural sector in Zimbabwe, although it is having a profound effect, particularly on commercial production and export commodities.

1.1.2 The Limpopo river basin

The Limpopo river basin covers 1.3 percent of the African continent and spreads over parts of four countries; Botswana, Mozambique, South Africa and Zimbabwe (Annexure 1). The river basin supports remarkable vegetation and freshwater ecosystems that provide an important source of food and income for local communities. However, due to rapid urbanization and tourism development, there has been extensive environmental degradation. At the mouth of the river, there is salt water intrusion at high tide which is affecting the quality of irrigation water and raises soil salinity (CPWF, 2003).

The Limpopo river basin is a semi-arid area, dependent on rain-fed subsistence agriculture on small landholdings. Annual rainfall in the basin ranges from 200 to 1200 mm (CPWF, 2003). Although most parts of the basin have highly unreliable rainfall, frequent droughts and insecure crop production, the basin's local economies depend on rain-fed farming. This is characterized by low productivity, high risk, vulnerability to intermittent droughts (sometimes devastating floods), poor adoption of improved technologies, labour scarcity due to out migration and HIV/AIDS, and poorly developed input and output markets. Many parts of the basin are routinely food deficient and around a million people rely on food aid. Poverty is widespread with an average poverty rate of 52 percent (Mgonja *et al.*, 2006). The dry conditions are more suitable for livestock rearing and can only permit drought tolerant small grains e.g. sorghum and millet. These are the food staples as well as cash crops in the basin. The level of damage to the environment means that any attempt to rehabilitate irrigation infrastructure on the basin has to work parallel to conservation of the basin environment. Therefore, for the most part, the potential of irrigated agriculture is limited. Increases in agricultural production have to be achieved through rain-fed cropping systems. The Challenge Program on Water and Food and other local partners are working to improve food security and maximize the use of available water.

1.2 Problem statement

Sorghum and millet are major food crops that are widely grown in Zimbabwe. They are the third (sorghum) and fourth (millet) most widely grown cereal grain crops in the agricultural economy,

after wheat and maize. Zimbabwe produces an annual average of over 87 000 tons of sorghum and 54 000 tons of millet (FAOstat, 2008). Yet, virtually the entire production is carried out on a subsistence basis. Sorghum and millet are, therefore, generally regarded as subsistence food crops. There is no doubt that the two crops are essential for the attainment of food security and for the establishment of sustainable production systems in the semi-arid region (Chisi, 2007).

Despite their relative importance in rural food systems, very little sorghum and millet is commercially processed (Rohrbach, 1990). A relatively small proportion of rural households sells staple food grains and for those who do sell, the quantity is often small (Barrett, 2008). Thus, the main contribution of sorghum and millet is towards farm household food security, although production levels are often not meeting family food requirements. Historically, smallholder sorghum and millet producer participation in the market has been low. In most SADC countries, formal sector (government regulated) markets handle only a small proportion of total sorghum and millet production. They handle less than ten percent of total production in several countries including Lesotho, Swaziland, Tanzania, Zambia and Zimbabwe. However, in Botswana, 25 percent of total sorghum production goes through formal markets (FAO, 1995). The relative importance of sorghum and millet in rural food systems suggests the existence of substantial opportunities for their commercialization. Focusing on sorghum and millet production and promoting their consumption would be one of the ways to increase the participation of smallholder farmers in the market and, thus, improve their incomes. It is about linking smallholder farmers to technologies that they need on one side of the chain and to product markets for the commodity on the other side.

The body of empirical evidence concerning smallholder cereal grain market participation patterns and determinants of participation in Africa and specifically Zimbabwe is thin. Research on market participation issues with respect to sorghum and millet is limited (Rohrbach, 1991; Amira, 1992; Rohrbach & Kiriwaggulu, 2001; Rohrbach, 2003; Barrett, 2008).

1.3 Research objectives

The overall objective of the study is to identify the determinants of market participation of smallholder sorghum and millet farmers and to propose strategies for improving their market participation. The specific objectives are to

(i) Review existing marketing arrangements for different types of commodity crops in Zimbabwe;

(ii) Determine the levels of marketable surplus among sorghum and millet smallholder farmers;

(iii) Identify the types of transaction costs that may affect market participation for sorghum and millet smallholder farmers; and

(iv) Identify factors distinguishing sellers and non-sellers of sorghum and millet.

1.4 Statement of hypotheses

The main hypothesis of the study is that transaction cost related factors (e.g. access to information, road access, distance to the market, and time of payment for sold grain) and wealth-ranking factors (e.g. number of livestock owned, area of land cultivated, crops grown, amount of grain produced, and mode of transport to the market) are the major factors affecting participation of sorghum and millet smallholder farmers in the market.

1.5 Definition of key terms

1.5.1 Market participation

Various definitions of market participation have been suggested by different authors. Some authors consider market participation as any market related activity which promotes the sale of produce (Key *et al*., 2000; Holloway & Ehui, 2002; Lapar *et al*., 2002). Market participation can be referred to as commercialization (Latt & Nieuwoudt, 1988). It can also be described as an individual's or household's economic transactions with others, in cash or kind (Von Braun *et al*., 1991). Staal *et al*. (1997) mentioned that a low proportion of products exchanged in the market

reflects limited market participation. With the three possible states of buying, selling or not trading, Goetz (1992) defines market participation using household purchases and sales. Volumes of produce traded are used to determine market participation. In an agricultural market economy, market participation or commercialization occurs mainly when farmers stop being mostly subsistence farmers and become profit-oriented. Market participation is in that case defined as earnings from market activities (Makhura *et al.*, 1997; Makhura, 2001).

The various market participation definitions and measurements do not rule out quantity or produce sold or sales volumes. In this study, both the presence of sales and the volume of sales will be used as a measure for market participation. This is because market participation for subsistence smallholder farmers is directly related to generation of a marketable surplus, which in turn depends on productivity levels.

1.5.2 The market

The market can be categorized into local and international market. Local market refers to a set of actual and potential buyers within a given geographical area where the seller is also located. The target boundary may be a village, district, town, province, country or specific region. The international market refers to a set of actual and potential consumers beyond geographic boundaries and in most cases outside the national borders. Cross-border issues like tariffs, custom procedures, trade agreements, for example, are taken into account (Kotler, 2003). In this study, the market refers to both local and international markets.

1.5.3 Marketing

Marketing is defined by the American Marketing Association as an organizational function and a set of processes for creating, communicating and delivering value to customers and for managing customer relationships in ways that benefit the organization and its stakeholders. The social definition of marketing is that marketing is a societal process by which individuals and groups obtain what they need and want through creating, offering and freely exchanging products and services of value with others. The role of marketing is to deliver a higher standard of living.

Managerial definition of marketing describes marketing as the art of selling products (Kotler, 2003).

1.5.4 Smallholder farmers

The word smallholder farmer embraces a wide spectrum of all small-scale indigenous producers in Africa (Hungwe, 2006). Smallholder farmer means different things depending on the country one is looking at. Within a South African context, smallholder farmers are black farmers most of whom reside in former homelands (Machethe & Mollel, 2000). Smallholder farmers in Zimbabwe are mostly black farmers who are food insecure, particularly in low rainfall areas where rain-fed agriculture is almost always a failure. They suffer from low incomes and living standards, poor nutrition, housing and health and are often unable to send their children to school (FAO, 1996). However, it is important to note that not every black farmer is a smallholder farmer.

Various terms have been used in literature to define smallholder farmers. These include; small-scale farmers, peasant farmers, resource-poor farmers, subsistence farmers, food deficit farmers, household food security farmers and emerging farmers. The main criteria used by various writers to classify farmers as smallholder farmers include land size, purpose of production (i.e. whether for home consumption or market), income level (i.e. whether poor or rich), and in South Africa racial group (i.e. whether one is white or black and thus historically advantaged or disadvantaged, respectively) (Machethe & Mollel, 2000).

Smallholder farmers are a heterogeneous group whose resources, livelihood patterns and income sources are quite diverse (Machethe & Mollel, 2000; FAO & UNDP, 2001; Machethe *et al.*, 2004; Maltsoglou & Tanyeri-Abur, 2005). Smallholder farmers are the people who make up the great bulk of the population in most southern African countries. These small holdings are often found in poorer areas, less favourable for agricultural production (Hungwe, 2006). Hence their participation in markets depends on their income sources, other social and or demographic factors and the variety of economic and social costs they encounter. Smallholder farmers are

defined in this thesis as black resource-poor farmers who produce mainly for home consumption. They rely largely on family labour, own a few livestock and small pieces of land.

1.6 Outline of the study

The remainder of the thesis is outlined as follows: Chapter 2 presents a review of literature on production, processing, utilization and marketing of small grains in Zimbabwe. Literature review on the determinants of market participation by smallholder farmers is presented in Chapter 3. Chapter 4 reviews literature on the strategies for improving participation of smallholder farmers in the market. Data sources and characteristics of the sample are discussed in Chapter 5 while analytical techniques and the estimation procedure are outlined in Chapter 6. The results of the study are presented in Chapter 7. The thesis concludes with a summary of the study, key conclusions, recommendations, policy implications and areas for further research in Chapter 8.

CHAPTER 2

SMALL GRAIN PRODUCTION, PROCESSING, UTILIZATION AND MARKETING IN ZIMBABWE

2.1 Introduction

This chapter reviews literature on the production, processing, utilization and marketing of sorghum and millet in Zimbabwe. A section of the chapter is devoted to smallholder farmers' marketing problem analysis based on literature review. The final section of the chapter presents a review of literature on contract farming as an existing form of marketing in Zimbabwe for different commodity crops.

2.2 Sorghum and millet production in Zimbabwe

Sorghum and millet are more tolerant to moisture stress and have usually performed better than maize during seasons of extremely low rainfall, for example, 52 000 ha of maize produced 3 600 tons of grain compared to 6 600 tons of grain from 22 000 ha of millet in Matabeleland South province of Zimbabwe during the 2006/07 season (FAO & WFP, 2007). Small grain production has considerably increased in several countries during the past few years. With the simultaneous increase in the production of wheat and rice, millet and sorghum face competition from the utilization point of view. Already there is an increasing trend of using maize, wheat or rice in place of sorghum even in those regions where sorghum had been the traditional staple grain in the past (Tariq & Sawandi, 2003).

Zimbabwe produces an annual average of over 87 000 tons of sorghum and 54 000 tons of millet. These are the third and fourth most widely grown cereal grain crops, after maize and wheat, in the agricultural economy (Figure 1A). Yet most of the production is carried out on a subsistence basis particularly for millet. The communal farming sector produces most of the cereal grains although the sector has the least yield levels. According to Central Statistical Office (2000), over a million smallholder farmers grow grain crops and over half a million grow small grain crops.
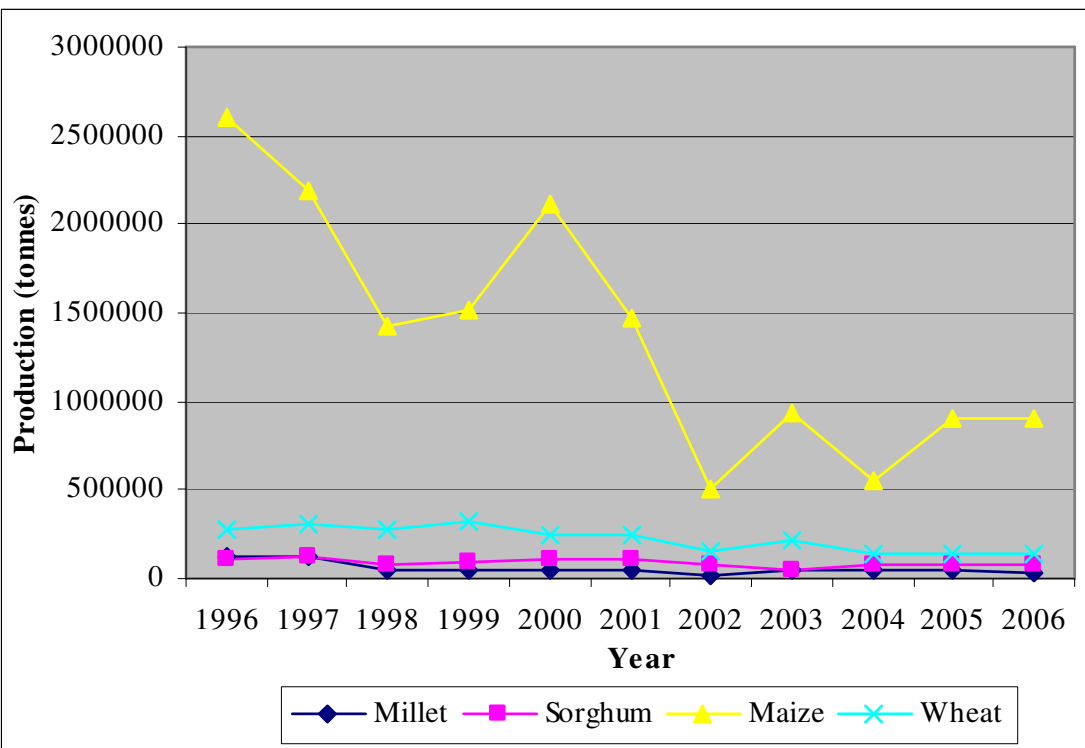
Figure 1A: Annual cereal grain production levels in Zimbabwe (1996-2006)
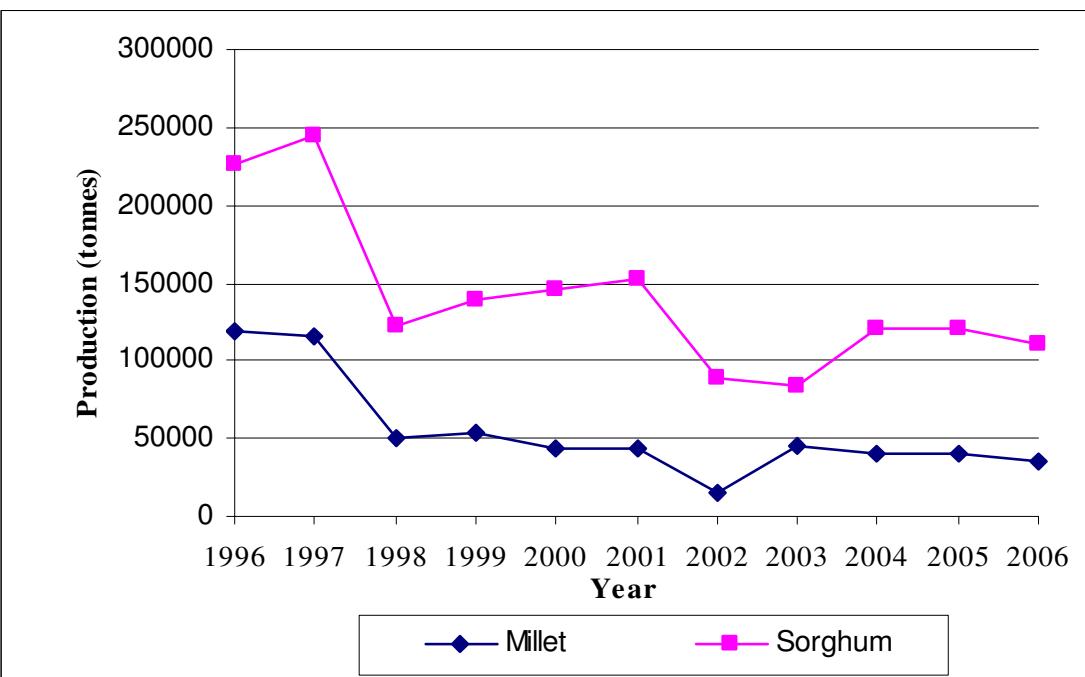
Figure 1B: Annual small grain production levels in Zimbabwe (1996-2006)

Source: FAO (2008)

Maize production has dropped by more than 80 percent in the last ten years while sorghum and millet production trends have remained flat and at low levels (Figure 1B). A significant amount

of resources would be required to turn the maize trend around. The main reason for this unsatisfactory performance is disinvestment from agriculture in the last ten years. Unfavourable weather conditions should not be an excuse at all because weather conditions in some of these years have been good.

Sorghum and millet are grown in the semi-arid regions of Matabeleland North and South, Masvingo and in the drier parts of Midlands, Mashonaland Central, Mashonaland East and Manicaland provinces (Figure 2). Only a small proportion of the harvest enters the formal market; the remainder is consumed on-farm. Consequently, the main contribution of sorghum and millet is to farm household food security. Most sorghum and millet[2] area is sown to traditional, unimproved varieties. The prevalent use of traditional, unimproved varieties (local landraces) may be due to reasons that have been cited in literature regarding low adoption of improved varieties. Some of the reasons are; inability of resource-poor smallholder farmers to purchase hybrid seed, the poor milling and storage properties of the improved varieties, and inadequate attention to the quality of the varieties as perceived by consumers of sorghum and millet products (FAO, 2003; Chisi, 2007; Mafuru *et al.*, 2007)

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[2] Pearl millet constitutes a greater proportion of millet production in the country; therefore all references to millet in this paper refer to pearl millet.
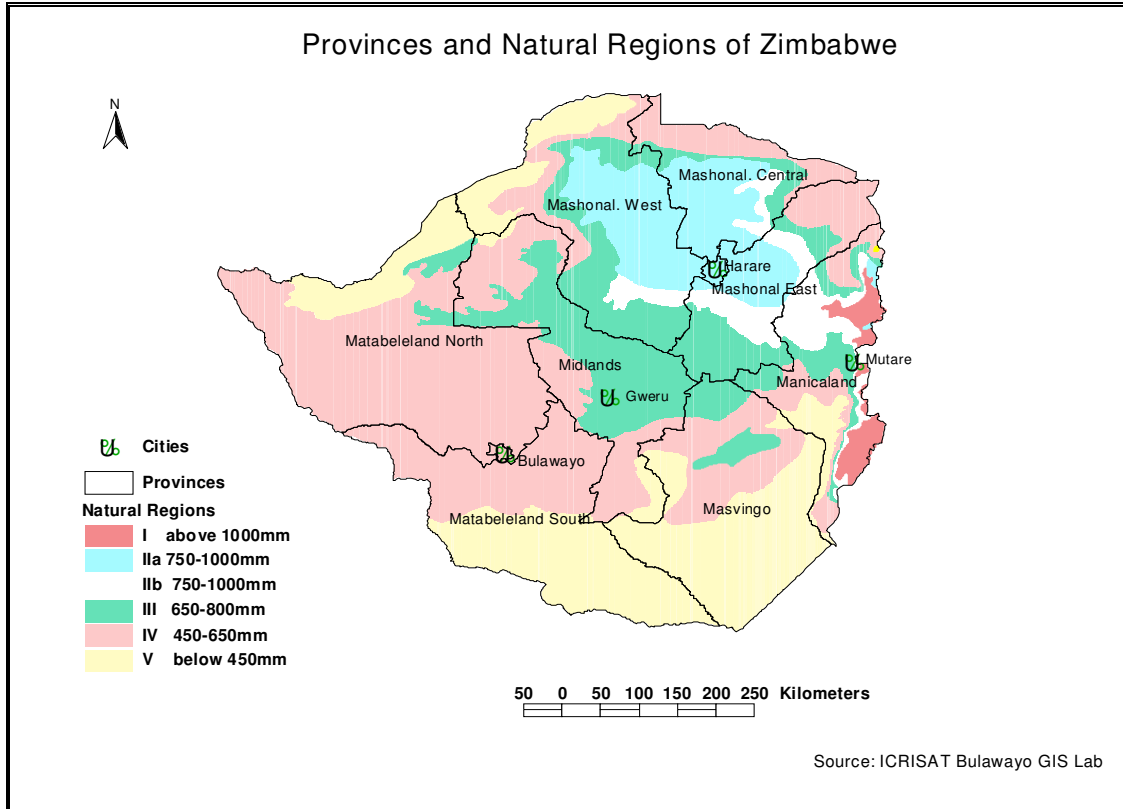
Figure 2: Rainfall levels by province in Zimbabwe
Source: ICRISAT (2008)

Maize is widely grown in Zimbabwe and constituted 75 percent on average of the total grain area harvested from all sectors (commercial farms, communal lands and resettlement schemes combined) in the period 1985 to 2006 as reflected in Figure 3. Millet, sorghum and wheat constituted a quarter of the total average harvested area of the major cereal crops grown in Zimbabwe during the same period.
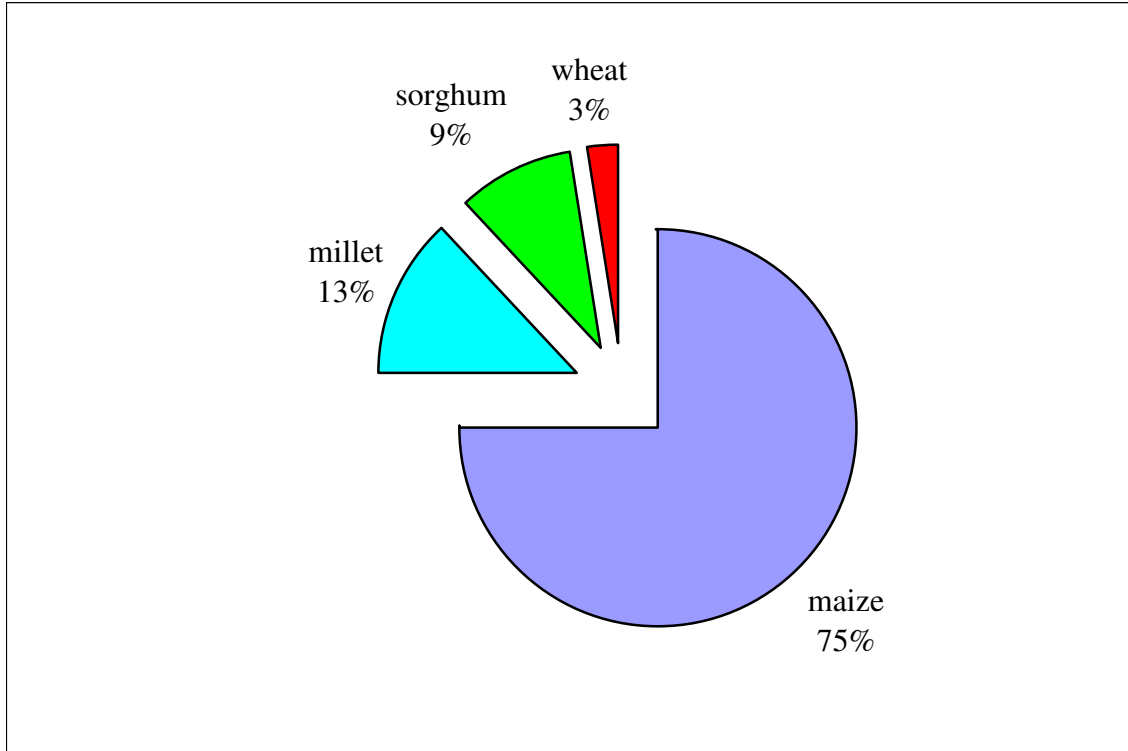
Figure 3: Average harvested area for cereal crops grown in Zimbabwe by all sectors (1985-2006)
Source: FAO (2007)

Figure 4 shows mean yields for maize, sorghum and millet for a ten year period, 1996-2006. This information adds to the argument about the competitiveness of sorghum, millet and maize. One of the main reasons for poor sorghum and millet competitiveness is that yield per hectare for sorghum and millet is low in relation to maize. Even in relatively dry years, with the exception of 2002 and 2004, it is evident that maize yield still surpasses that for sorghum and millet.
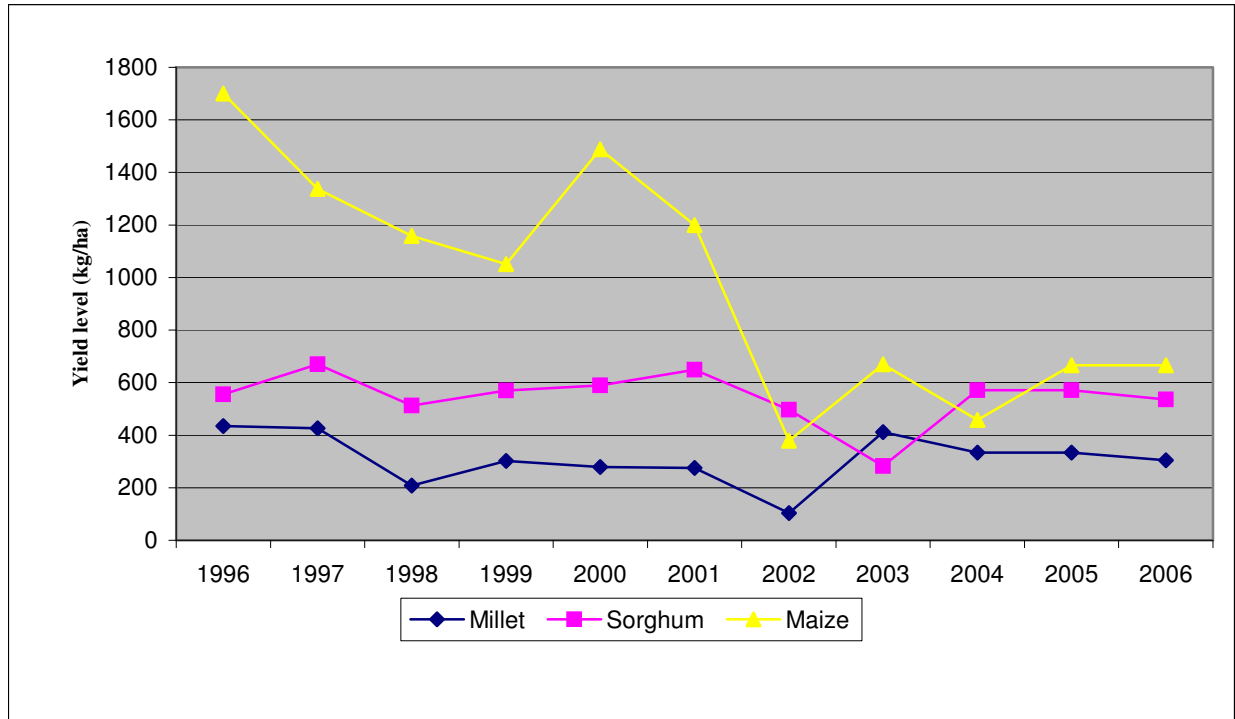
Figure 4: Mean grain yields in Zimbabwe (1996-2006)
Source: FAO (2008)

2.3 Sorghum and millet processing and utilization

Women have traditionally decorticated sorghum and millet to improve the taste and eating quality of the grains. Decorticated grains also benefit the flavour of the flour produced from milling. Manual decorticating is time and labour consuming. The absence of appropriate dehulling equipment, especially for small grains, has often been cited as a reason for past neglect of these cereals. There was a dehuller technology introduced at different scales in selected countries in Africa since the mid-80s and in India since 1975 that was intended to free women from this drudgery, but it was never promoted. This applied research was supported by the International Development Research Centre (IDRC) to emphasize small-scale processing of sorghum and pearl millet near the farm. In Africa, the industrial processing of sorghum for food was systematically inhibited by state policies until the mid to late 80s (Bassey & Schmidt, 1989).

While maize and wheat are broadly identified as cash crops, sorghum and millet are referred to as subsistence crops partly because of the limited historical market demand for these crops. Few traders or buyers look for these grains; consequently farmers have little incentive to produce a

consistent surplus. Industries have been known to refuse to purchase and utilize these crops because maize is readily available and cheaper. The limited quantities of sorghum and millet currently absorbed by the food and feed industries reflect both a lack of familiarity with these crops and uncertainty about consumer demand. The other reason for lack of competitiveness of these crops is the low average grain yield. Industry is also concerned about grain quality and price (Rohrbach & Kiriwaggulu, 2001).

Small grains are utilized extensively in the brewing industry as a flavouring ingredient or source of malt. In Zimbabwe, this industry is mainly dominated by Chibuku breweries which have more than 16 branches throughout the country and buys 80 percent of red sorghum on the market. There are other breweries that operate regionally and are not distributed around the country, for example, Ingwebu in Bulawayo, Simba in Kwekwe, Pungwe in Mutare and Go Beer in Gweru (CARE International, 2001). The small grains will remain uncompetitive as long as their productivity remains lower than that of maize and the assembly and transport costs associated with the collection and movement of grain to the processing plant are high. The brewing industries in Zimbabwe and Tanzania derive their sorghum largely from large-scale commercial farms close to their breweries. This practice allows a greater degree of control over the quality of the grain as well as low costs (CARE International, 2001).

Large stockfeed companies (i.e. Agrifoods and National Foods) dominate the industry, although some large-scale farmers engaged in livestock production buy their own grain to make their own stockfeed (e.g. Irvines Poultry). This industry is closely linked to the milling industry since the stockfeed producers buy maize bran from millers. According to specialists in the Zimbabwe animal feeds industry, white sorghum can replace 100 percent of the maize used in poultry and ruminant diets. Amira (1992) recommended a maximum of 30 percent of red sorghum inclusion and no upper limit or restriction for white sorghums in pen finishing diets. Red sorghum can be used up to 15 percent in poultry rations, and 30 percent in ruminant rations, without substantial reduction in feed quality. Pearl millet can replace 50 percent of the maize in these same diets. This demonstrates that sorghum and millet has a future if yields are increased.

In the milling industry, sorghum and millet utilization has been limited to household level in communal areas. Commercially, a small milling company in Bulawayo, INDUNA Foods, has been milling and packaging sorghum. Most of the grain was purchased from the southern part of Zimbabwe (CARE International, 2001). Previous studies have shown that four main constraints appear to limit the use of small grains in the milling industry in many small grain producing countries: uncertain demand, non-availability of grain, thin markets and poor grain quality (Rohrbach & Kiriwaggulu, 2001). Also the absence of appropriate dehulling equipment for small grains has been cited as a reason for past neglect of these crops. Efforts to increase food production must, therefore, be matched by corresponding research on post-harvest handling and processing. A food crop only becomes food when it is actually consumed (Bassey & Schmidt, 1989).

2.4 The marketing of small grains in Zimbabwe

Zimbabwe's grain marketing system transformed dramatically in the 1990s from a government-controlled system to a system in which all cereal grain prices are determined by market forces. All agricultural produce marketing was regulated through the Agricultural Marketing Authority until 1994. The Grain Marketing Board (GMB) was the sole buyer of all grain before market deregulation in 1991. The government embarked on liberalization programmes due to the general failure of parastatal marketing boards and donor pressure. This market evolution resulted in many players getting involved in the marketing of sorghum and millet (though in smaller quantities relative to maize) and all other crops. Smallholder farmers, however, have always been disadvantaged even with any marketing system which operated. The situation has worsened given that now prices of agricultural commodities are market determined. The exception is the GMB, which still sets floor prices for commodities which it used to buy and sell. Despite some agricultural producers getting high prices for their commodities, smallholder farmers are still getting low returns especially for sorghum and millets (FAO, 1995; CARE International, 2001; Rohrbach, 2003). Thus, there is need to empower these farmers and train them in better marketing strategies to realize what they actually deserve, in terms of prices.

2.4.1 The Agricultural Marketing Authority (AMA)

The Agricultural Marketing Authority Act (Act 26/2004) [Chapter 18:24] commenced on the 1st of June 2005. This was an act to establish the Agricultural Marketing Authority to regulate, supervise, develop and administer the marketing of agricultural products; to grant powers on the Authority to supervise any statutory body charged with the marketing of specific agricultural products; to provide for the constitution and functions of a board of the Authority; to provide for the establishment of an Agricultural Marketing Fund for the development of the marketing of agricultural products; to provide for the imposition and collection of levies on producers, buyers and processors of agricultural products; to provide for the administration and disbursement of moneys from the Fund; to provide for the fixing of quality standards and other matters relating to agricultural products produced in Zimbabwe and to repeal the Agricultural Products Marketing Act [Chapter 18:22].

This Act provided for the establishment of the Agricultural Marketing Authority and the Agricultural Marketing Fund, provided rules for the marketing of agricultural products and provided for the promotion of the marketing of agricultural products. The Act consisted of 51 sections divided into six parts. An "agricultural product" means any animal, plant, product or thing whatsoever, which is used or produced in the course of agriculture or derived from agriculture, i.e. from horticulture, viticulture, forestry and aquaculture. This also includes the use of land for any purpose of husbandry. Among its powers and functions, the act was to promote contract farming of strategic crops such as sorghum and millet (FAO, 2004a).

2.4.2 The Grain Marketing Board (GMB)

The Grain Marketing Board was established in Zimbabwe in 1931 in response to the 1930 world recession. Its main purpose, which has largely remained the same over the seven decades, is to ensure food security in Zimbabwe with particular reference to staple food crops, namely, maize, wheat, sorghum and millet. The GMB is, as its name implies, an institution whose main function, within its main purpose of ensuring the country's food security, is the orderly marketing of agricultural products, mainly cereal grains, oilseeds, edible beans and coffee, within Zimbabwe.

The GMB buys several of these crops from farmers and sells them into the domestic agro-processing industry in addition to exporting these products to regional and international markets. When in short supply, the GMB imports these products from both regional and international sources.

A number of smallholder farmers, who produce adequate surplus for sale, sell their produce to GMB, which has storage facilities and purchasing points around the country and the production areas. Another important function of the board is the storage of grain for anyone who wishes their grain to be stored. In recent years, the GMB has successfully ventured into downstream industry, which has seen it involved in the pre-packing and processing of agro products. The GMB has a network of depots and processing units in excess of 70 in number. These depots are strategically located throughout Zimbabwe. However, the GMB has serious problems in relation to paying farmers on time soon after delivery of produce to any one of its depots. In addition, the Board has serious problems in getting timely information from its system for decision-making (CARE International, 2001; Dexel Zimbabwe, 2008).

2.4.3 Zimbabwe Agricultural Commodity Exchange (ZIMACE)

The idea of ZIMACE arose in the early 1990s, when the government committed itself to liberalize agricultural marketing, which was under parastatal control for years. It became apparent that an organization was needed through which free marketing of agricultural commodities could occur. It was recommended that a commodity exchange marketing system be implemented on an experimental basis as an alternative market for decontrolled commodities. Thus, ZIMACE evolved on 1 March 1994. ZIMACE was started by interested parties in the private sector, namely, the Commercial Farmer's Union and Edwards and Company, a local firm of stockbrokers. Initially, ZIMACE employed brokers who traded for the exchange.

The establishment of ZIMACE in 1994 as a price discovery mechanism has brought together buyer and seller to negotiate trades in a competitive, transparent market place. Contracts in spot and forward markets are traded on the exchange and the exchange publishes daily information about market prices and the number of trades. The exchange facilitates trades in almost all of

Zimbabwe's major crops, including sorghum and millet, with the exception of tobacco and horticultural crops. ZIMACE oversees the contractual obligations of each willing buyer and willing seller and in effect performs an arbitration role (Masanganise, 2002).

2.4.4 Non-governmental organisations' involvement in the sorghum and millet market

The Market Assistance Programme (MAP)

Non-governmental organizations (NGOs) have also been involved in promoting the marketing of small grains (e.g. involvement of the Consortium for Southern Africa Food Security Emergency (C-SAFE), World Vision and Catholic Relief Services in Zimbabwe). This intervention came about due to a livelihoods crisis for the majority of the country's rural and urban poor, which resulted from multiple shocks on agriculture over years, including recurrent droughts, the impact of HIV/AIDS and volatile political environment. C-SAFE has been addressing acute food security problems in Zimbabwe and other southern African countries since 2002. C-SAFE piloted and implemented a market intervention programme, namely, The Market Assistance Programme (MAP), one of the first of its kind in an emergency context in addition to food aid interventions. This programme was necessitated by significant fluctuations in the availability and prices of various foods, including the major staple, maize. Rural households, in particular, have had to supplement their meagre harvests with market purchases, often using cash that would otherwise go towards meeting other basic needs, such as health and education.

In 2004, World Vision embarked on a commodity-substitution programme in Bulawayo. This was following a successful pilot scheme by Catholic Relief Services (CRS) in 2003. MAP's main objectives were to maximize the availability and affordability of sorghum meal (a less preferred alternative to maize) for the urban low-income population and to stimulate market activity. The sorghum grain was bought outside Zimbabwe and transported to World Vision managed warehouses in Bulawayo. Once millers and vendors have been identified, the process of milling and packaging into 5 kg bags began. Bags were then delivered to vendors, who retained 15% of the sale price. Sales fluctuations of sorghum meal corresponded with the availability of maize meal in the retail network, which is consumers' first choice.

In order to reach the target population (urban low-income families living in high-density areas of selected towns); the sorghum meal was distributed through a carefully selected retail network, based on viability, vulnerability and feasibility. Potential product leakage out of the targeted locations was strictly controlled and monitored on an ongoing basis. In order to respond to the vulnerability and food insecurity in the targeted area, the subsidized price of the product was monitored and adjusted regularly. Since 2004, 5,390 tons of sorghum have been processed and channelled through the retail network (Devidze, 2008).

Despite the free marketing conditions for sorghum and millet, the importance and value of maize in the diets of many Zimbabweans compared to the other grain crops has generally made the price of the smaller grains lower (Table 1). As a result, the returns from sorghum and millet are lower and it becomes more profitable to grow maize than the smaller grains. Sorghum costs more to produce than maize because it requires more labour input, yet the produce price does not match the costs. However, in many informal markets across the SADC region, maize is cheaper than sorghum. Hence, there may be good potential for expanding the production of sorghum and millet in view of price differences (FAO, 1995).

Table 1: Cereal grain buying prices (Z$/t) offered by industry in Zimbabwe, June 2001

| | | Price | | |
| | | **Maize** | **Sorghum** | **Millet** |
Industry	**Buyer**			
Brewing	Chibuku breweries	7500	7000	No purchases
	Ingwebu breweries	7500	6500	7000
Milling	Jati millers	8500	5557	No purchases
	Blue Ribbon	8000	No purchases	No purchases
	National Foods	8200	8000	7000
Stock feed	Feeds & Feeds	7500	5500	5000
	National Foods	8200	8000	7000
	Agrifoods	8400	6900	8000
	Premier milling	8300	6000	6500
Grain trading	Grain Marketing Board	7500	5500	5000

Source: Rohrbach (2003)

There is often a concern that informal traders are cheating the communal farmers by buying at prices lower than the GMB price. These traders, however, provide services desired by the farmer,

which need to be considered. The traders, however, spot cash, which is desirable to farmers, as they will need to meet their household cash needs. They can also buy as little as a 20 litre tin of grain, thus accommodating the small quantities that the farmers might be able to sell. By providing their transport to go into the communal areas and source the grain, they incur transport and administration costs. The traders need to cover these costs and also be able to make a profit. The costs are then passed on to the farmer and subtracted from the buying price (CARE International, 2001).

2.4.5 Smallholder farmers' marketing problem analysis

Although there could be alternative marketing channels for smallholder farmers, there are some technical, social and economic constraints which need to be addressed before these farmers can fully benefit from any market channel. For smallholder farmers to be able to participate in the market, there are a number of policy areas that combine to create an overall policy environment that need to be addressed (Jayne *et al.*, 2007). Historically, there have been constraints to improving smallholder participation in markets and some of them are as outlined below.

2.4.5.1 Low and unstable grain supplies

In most developing countries, including Zimbabwe, grain supply by smallholder farmers is unstable. This is mostly because of low population density and low scale of production. Assembling small quantities of grain from many smallholder farmers raises marketing costs (Jacobs, 2008).

2.4.5.2 Storage

Smallholder producers are required to store some of their crops like maize in order to benefit from the present market opportunities. In a liberalized market, prices of commodities are determined by the prevailing levels of supply and demand on the market. Thus, for agricultural commodities, prices tend to be very low just after harvesting, which calls for farmers to store their commodities for later sale (Jacobs, 2008; Omoti *et al*., 2009). However, storage facilities

for most smallholder farmers are not good and big enough to store commodities for later sale. There is therefore need for smallholder farmers to improve on their storage structures for them to benefit from this market opportunity (Masanganise, 2002).

2.4.5.3 Farmers' limited capacity for collective action

Farmers in rural areas are often held back by the daily stress of getting essential supplies and transporting their produce to markets. Smallholder farmers rarely form part of marketing trusts (Jacobs, 2008). The fact that they produce small quantities makes transportation expensive for individual farmers hence a need for collective action.

2.4.5.4 Attitudes and behaviour

Smallholder farmers' attitudes and mindset needs to be changed so that they can be market-oriented instead of being sellers of surplus produce. This would help in making a decision to sell and in selection of buyers. If farmers are sellers of surplus, they tend to sell to private traders who usually offer lower prices or barter trade with basic commodities, for example, 17 kg maize grain for 750 ml cooking oil or 2 kg sugar and 9 kg of maize grain for a bar of soap (CARE International, 2001; Masanganise, 2002).

2.4.5.5 High processing costs for small grains

The high processing costs are exacerbated by the need to clean the poor quality grain to industrial and commercial standard specifications. Grain quality is more variable in sorghum and millet than in maize. The range of varieties grown and traded are more variable than maize in terms of colour, size, shape, hardness and keeping quality. Mixed grains cause mill extraction rates to decline. If a consistent type of grain is sought, marketing costs may increase (Rohrbach & Kiriwaggulu, 2001). In addition, sorghum has been reported to be more difficult to clean in comparison to maize. During sorghum threshing, sand, stones and dung are commonly picked up and deposited in the grain bags. These are similar in size and colour to the grain hence difficult to clean. The commercial processors are also often unreceptive to the idea of substituting maize

with the unfamiliar small grains (i.e. sorghum and millet), which are predominantly produced by smallholder farmers, whose industrial quality they are not sure of. Processors prefer maize whose availability is not only dependable but also competitively priced.

2.4.5.6 Unreliable markets

Smallholder farmers are also reluctant to invest in crops whose product prices are not reliable. It is common to see smallholder farmers in marginal areas dedicating large tracts of land to maize cropping yet they hold a huge comparative advantage in small grains (sorghum, millet, etc) which are adaptable to their semi-arid agro-ecological conditions (Jayne *et al.*, 2007).

2.4.5.7 Highly competitive international markets

International agricultural markets are highly competitive, even large scale commercial farmers are struggling. Smallholder farmers may not be able to survive. International donors try to convince African governments of the virtues of liberalization and open markets, but then subsidize their agriculture and affect world prices for African crop exports and imports in the process (World Bank, 2001).

2.4.5.8 Lack of finance

Farmers have limited cash resources to purchase enough inputs for cropping especially fertilizer and seed. Because of this, the demand for inputs by smallholder farmers is very low and uncertain especially after drought. This makes manufacturers to produce less as they also require security for their money and cannot predict *ex ante* whether the cropping season (therefore demand for inputs) will be good or not (Poulton *et al*., 2002; Jayne *et al.*, 2007).

2.4.5.9 High credit requirements and credit risk

Farm input distributors have high credit requirements to cover the high storage costs of bulky inputs like fertilizers which have seasonal demand. There is need to relate closely with credit agencies for both input distributors and farmers. However, there is high credit risk as well related to repayment in years of poor rainfall (Poulton *et al*., 2002; Jayne *et al.*, 2007).

2.4.5.10 High transaction costs of selling small quantities of inputs

The transaction costs of selling small quantities of inputs like fertiliser and seed to large numbers of buyers dispersed over wide areas with poor infrastructure are high. Smallholder farmers buy seed and fertilizer in small quantities as and when the rainfall is good and depending on stage of growth of the crops (Poulton *et al*., 2002). There are also high costs of setting up distribution networks. Government policies are often times distortionary when with or without NGOs distribute inputs for free. This benefits farmers because it provides fertilizer to those who normally would not buy, but disrupts the fertilizer commercial markets and increases the dependency on aid.

2.4.5.11 Stringent standards on quality and food safety in domestic and international markets

Most smallholder producers lose a lot of money due to the quality of their products. Recent trends in national, regional and international markets make it difficult for smallholder farmers to compete in agricultural markets. There are stringent standards on quality and food safety in domestic, regional and export markets because of globalisation and the emergence of supermarket chains. It has become difficult to make money on traditional staple food grains. There is need to teach farmers post harvest handling skills. Farmers should also be trained in grading and should know all the grades for the commodities they sell to avoid being cheated by buyers (Dessalegn, 1998).Contract farming may overcome this difficulty and therefore increase quality and consequently exports of some crops.

2.4.5.12 High transaction costs (search costs)

Smallholder farmers operate under high transaction costs due to lack of information, which creates higher risks. The poor are especially hit by such constraints, as they usually are poor in information, including the ability to collect and analyse markets and other types of economic information (Jayne *et al.*, 2007; Jacobs, 2008).

2.4.5.13 Poor infrastructure

Most roads in rural areas where smallholder producers live are in bad and chaotic states. Infrastructure deficiencies make transport exceedingly expensive, thus reducing the final margin. Smallholder farmers tend to be discriminated in access to infrastructure and services, also reducing their market activities, and adding to their transaction costs. This is in part due to inadequate public investment by government. African farmers, like those in other parts of the world, respond vigorously to price and non-price incentives (Dessalegn, 1998; World Bank, 2000/2001; Masanganise, 2002; Jacobs, 2008). But if public infrastructure, such as roads to remote agricultural areas, is undeveloped or underdeveloped, the impact of pricing and marketing reforms on output is muted. Inadequate infrastructure affects other sectors as well.

2.4.5.14 Transport facilities

There are few transporters available in rural areas to be used by smallholder farmers. The government should make efforts to lure some transporters to operate in the rural areas especially during the peak marketing period. This way, smallholder farmers would be able to benefit from urban market facilities (Masanganise, 2002; Jacobs, 2008).

These factors jointly raise the subjective costs of farmers' participation in markets and undermine incentives for farmers to supply standardized quality products, for adoption of new technologies and raises buyer transaction costs. These have been cited as major hindrances in trying to commercialize smallholder agriculture. However, one way of dealing with these supply constraints is through contractual arrangements among private-public agribusiness partnerships

and smallholder farmers through use of collective action. Hence this study partly seeks to establish the possible options for contract farming to benefit smallholder small grain producers.

2.4.6 Field crops and contracts in Zimbabwe

The category of field crops includes crops other than horticultural crops i.e. cereal grain (e.g. sorghum, millet, maize, etc) and oilseed (beans, sunflower, etc) crops. Traditionally, these crops have been marketed through government parastatals. With market liberalization, new companies now also purchase directly from farmers. Field crops are now sold either through contracts or directly without contracts. Both written and implied contracts are used. The contract stipulates the obligations of either party in the contract. Market liberalization has shifted the competitive position of sorghum and millet as industrial inputs. Several opaque brewing industries, for example, Chibuku and Ingwebu breweries, have already started contract farming arrangements with large-scale commercial farmers for a supply of high-quality sorghum. The milling industries have also perceived similar incentives. But the participation of most sorghum and millet producers in commercial grain markets is limited by the high cost of collecting grain from large numbers of small farmers in outlying areas. Trade ties with smallholder farmers are also discouraged by the quality requirements of particular industries.

Some brewing industries have, however, found a way round these constraints through dealing with groups of farmers instead of individual smallholder farmers. For example, Chibuku Breweries has a contract signed between itself and a group of farmers. Chibuku Breweries promotes red sorghum in Chivi, Zvishavane and Masvingo. In the 1998/99 season, Chibuku Breweries signed forward contracts with smallholder farmers to buy from them, the NS552 variety of red sorghum. This sorghum variety has continued to be the most preferred by breweries although new varieties from Pannar Seeds are also infiltrating the market. The company was to provide packaging material and transportation. The farmers were encouraged to work in groups and produce a minimum set target of 28 metric tons (equivalent to 20 hectares) of sorghum per season. Another example is that of Induna Foods. In the 1998/99 season, Induna Foods had a contract for white sorghum with Zvishavane, where farmers had to grow a variety (Macia) that was being tested by the International Crops Research Institute for the Semi-Arid

Tropics (ICRISAT). They also had to thresh the harvested crop using a Development Technology Centre (DTC) thresher, which was being tested at the time. The company was buying the sorghum and the farmer had to either deliver the grain in Zvishavane for a higher price or Induna Foods collected the grain at a slightly lower price at a minimum requirement of seven tons per collection.

The majority of contracting companies offered services whose provision could only be sustained if the farmer continued to sell his/her crop through the company. A typical example is The Cotton Company of Zimbabwe Limited (COTTCO), which has always offered crop packs to communal area cotton growers. Those who sold their cotton through the company became beneficiaries of subsequent disbursements of crop packs in subsequent years. Recently COTTCO has been more direct in its contracting of farmers to sell through it. In addition to the crop packs, farmers get loans for packaging material if they sell all their cotton through the company. Failure to do so would mean that the farmer would not be able to get packs in the following season. The proportion of farmers under contract farming by different cotton companies is around 70 percent in Zimbabwe (Chizarura, 2007).

Farmers sometimes decide to sell the contracted crop through channels other than to the contract company (side marketing). In Shamva, Olivine reported in 2002 that the beans that they had contracted farmers to produce were all sold to other buyers. Agricultural Seeds and Services believe that this defaulting was part of the farmers' learning processes. The company would therefore like to build a relationship of trust with the farmers so that they do not default. They hope to do this by ensuring that planting seed is given to those who will market the produce through the company.

Being poor, communal area farmers will nearly always be in cash flow problems. Companies that contract them need to purchase the produce timeously otherwise; farmers will sell it to the buyer who approaches them first with cash. The Olivine experience showed that small price increments above the contract price (e.g. 50 cents per kilogram) are enough to entice the farmers to sell to the non-contract companies. Farmers growing red sorghum also ended up selling their crop to middlemen when Chibuku breweries had delayed providing transport. The non-contract

companies are able to offer slightly higher prices since they have no costs to recover as they would not have invested anything leading towards the production of the crop (Mudhara & Kwaramba, 2002).

CHAPTER 3

DETERMINANTS OF MARKET PARTICIPATION BY SMALLHOLDER FARMERS

3.1 Introduction

This chapter reviews literature on the factors that influence the ability of smallholder farmers to actively participate in markets. The factors discussed are not exhaustive but provide the necessary foundation for the rest of the study. The chapter begins with a discussion on transaction costs as a major factor that may influence smallholder farmer participation in markets. A description of collective action theory and an explicit recognition that collective action is a factor that may influence market participation of smallholder farmers (through its effect on reducing transaction costs and increasing the bargaining power of farmers) forms part of this chapter. This section concentrates on the possibilities of reducing transaction costs through collective action whereby many scattered smallholder farmers with small volumes of grain yields can establish collection points to reduce the cost of assembling and transportation. A section is devoted to literature review on transaction costs, focusing on the findings of previous studies on the impact of transaction costs on market participation. The rest of the chapter reviews literature on other factors that may influence smallholder farmer participation in markets.

3.2 Transaction costs, collective action and market participation by smallholder farmers

3.2.1 Definition of transaction costs

Transaction costs are an important component of marketing that determines the extent of market participation for smallholder farmers. A transaction occurs whenever a good or service is transferred across a technologically separable interface (Williamson, 1991). Transaction costs are the embodiment of barriers to access to market participation by resource-poor smallholder farmers. Coase (1937) recognized that there are impediments to market exchange. Overcoming impediments to market exchange involves the firm bearing transaction costs. Examples of these

impediments are monopoly, or uncertainty, or difficulties associated with price determination. Insurance against opportunistic action by a monopoly customer can be achieved by entering into a contingent claims contract with the monopolist before commencing the exchange relationship. However, drafting, monitoring and enforcing such contracts involves monetary costs. These costs are transaction costs. Transaction costs can be divided into *ex ante*, costs during a transaction and *ex post* costs. These costs can be classified as information, negotiation, and monitoring and enforcement costs. Information costs (*ex ante*) relate to the costs incurred in obtaining information relative to the undertaking of the transaction (price information, market location, etc.). Negotiation costs represent the costs incurred while the transaction is being carried out (negotiation terms of exchange, drawing up the contract, etc.). Monitoring and enforcement costs (*ex post*) are the costs incurred once the transaction is completed and in order to ensure that the terms agreed upon *ex ante* are kept to (payment arrangements) (Hobbs, 1997). Transaction costs in a typical commodity trading setting are as shown on Table 2.

These costs can be extended to include the production facilities costs, the coordination costs and the communication costs of the firm (Pitelis, 1996). A transaction cost can therefore be viewed as the economic counterpart of friction in a mechanical system. Friction in this context is described as costs that arise when individuals exchange ownership rights to economic assets and enforce their property rights, determining contract terms, paying agent fees and negotiating, monitoring and enforcement costs (Rowlinson, 1997; Hobbs , 1997).

Table 2: Transaction costs in a typical commodity trading setting

Type of transaction costs		Source/Origin of costs	Tangible forms of transaction costs
Ex ante costs	Search Costs	Lack of knowledge about opportunities (e.g. products, prices, demand, supply, trading rights, market outlets)	Personal/Personnel Time, Travel Expenses, Communication Costs
	Screening Costs	Uncertainty about the reliability of potential suppliers/buyers. Uncertainty about the actual quality of goods/services offered.	Consulting Service Fees Advertising/Promotion Cost Cost of Credit Ratings
Costs during transaction	Bargaining Costs	Conflicting objectives and conflicting interests of transacting parties. Uncertainty about the willingness of others to trade on certain terms. Uncertainty over transactor rights and obligations.	Licensing Fees Insurance premiums
	Transfer Costs	Legal, extra legal or physical constraints on the movement/transfer of goods	Handling/storage costs, Transport Costs, Bribery and Corruption Expenses.
Ex post costs	Monitoring Costs	Uncertainty about transactor compliance with specified terms. Uncertainty about possible changes in the quality of goods and services.	Auditing Fees Product Inspection Charges Investment in Measurement Devices.
	Enforcement Costs	Uncertainty about the level of damages/injury to a transacting party arising from contractual non-compliance. Problems in exacting penalties through bilateral arrangements or through use of third parties.	Arbitration, Legal, Court Fees. Costs to Bring Social Pressure

Source: Jaffee (1995)

3.2.2 The transaction costs theory

The transaction costs approach, as developed by Coase (1937), Ouchi (1980) and Williamson (1991), focuses on how the characteristics of a transaction affect the costs of handling it through markets, bureaucracies, and other forms of organization. The transaction costs theory analyses the comparative costs of planning, adapting and monitoring transactions under alternative governance structures. The basic idea of the theory is to align transactions with governance structure in such a way that production and transaction costs are minimized (Fischer *et al.*, 2006). The approach argues that the organizational form or "governance structure" that minimizes the sum of production and transaction costs for a given activity will have a competitive advantage and hence tend to dominate that activity.

The transaction costs approach hypothesizes that the structure that an economic enterprise develops in a particular environment reflects the enterprise's attempt to minimize its production and business costs. Organizational forms that are most successful in reducing these costs in a given environment tend to become dominant there (Williamson, 1991). The basic assumption of the transaction costs theory is that firms seek to reduce the friction which includes the cost of information asymmetry, bounded rationality, opportunism, identifying suitable trading partners, specifying and detecting quality and gathering information.

However, the problem with the explicit introduction of transaction costs into economic analysis is that transaction costs are difficult to measure in the real world. Little empirical estimation of transaction costs can be found in current literature, even more so in the case of developing countries. Quantitative measurement of market transaction costs and quantification of the impact of institutions still remain as major hurdles when attempting to account for the impact of these costs. 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.

3.2.3 The collective action theory

Collective action occurs when individuals cooperate as a group in order to solve a shared problem. It may be in the sense of voluntary action taken by a group to achieve common interests (Meinzen-Dick & Di Gregorio, 2004). It involves establishment by the group of a mutually recognized set of rules that if followed would allow the group to achieve a common objective. There is increasing evidence that farmer groups/institutions offer one way for smallholder farmers to participate in the market more effectively. Acting collectively, smallholder farmers may be in a better position to reduce transaction costs of accessing inputs and output, obtain market information, secure access to new technologies and tap into high value markets, allowing them to compete with larger farmers and agribusinesses (Stockbridge *et al.,* 2003).

One of the most common justifications for farmer cooperation is that through collective action farmers are able to counterbalance the market power of their trading partners, leading to more equitable and efficient market outcomes. This argument arises most often with respect to

cooperative associations, such as farmer bargaining associations. It also applies to farmer cooperative firms. Cooperative associations or firms use their countervailing power to raise farm incomes in two ways: through redistributing existing income in the farmers' favour and through increasing the efficiency of the economic system.

Advocates of collective action by farmers have long argued that markets in which farmers face highly concentrated input, marketing, and processing industries generate a fundamentally unjust distribution of income, both in terms of the income received by farmers as a whole compared to other participants in the economy and in terms of the inequality of incomes among farmers that results from buyers playing one farmer off against another. By uniting in a bargaining association, farmers may be able to redistribute income in their favour if the association can effectively control enough of the supply to influence prices and force investor-owned firms (IOFs) to treat all members of the association equally. Much of the potential of farmer cooperatives to use countervailing power to redistribute income lies in the ability of these associations to limit the appropriation of rents by farmers' trading partners. The creation of a farmers' collective bargaining association or a farmer-owned firm may limit the scope for such opportunistic behaviour by reducing the ability of an IOF to act as a discriminating monopolist (through forcing the firm to treat all farmers equally) and by increasing the actual or potential competition facing the IOF (Staatz, 1987).

The formation of cooperative firms may appeal to farmers not only as a means of increasing farm income but also as a way of strengthening rural communities and redistributing power in society (Staatz, 1987). The promise of increased economic efficiency through countervailing power also may induce farmers to form cooperative associations or firms and the state to support their creation. Farmers do not form or join cooperatives simply to reduce transaction costs; but also to try to redistribute rights in the farmers' favour. Particularly where farmer members have strong common interests, as in single commodity organizations, farmer cooperative associations may be an important means by which farmers can unite to take political action.

The uncertainty principle states that the greater the uncertainty surrounding a transaction, the less likely the transaction is to be efficiently mediated by autonomous market contracting

(Williamson, 1996). As uncertainty increases, so does the cost of renegotiating contracts; as unforeseen contingencies arise, so does the potential for opportunistic behaviour. An increase in uncertainty therefore creates incentives to shift from institutions like the spot market to contingent contracts and vertical integration. Because farmer cooperative firms can increase elements of both vertical integration and contingency contracting, they may offer more ways of dealing with uncertainty than either IOFs or bargaining associations. Given the potential benefits from collective action, the many scattered smallholder farmers can also benefit. By examining the conditions under which collective action via formation of farmer associations offers advantages to farmers, the transaction costs approach can therefore be used to highlight the situations in which farmer associations are most likely to arise and offer a competitive advantage to the farmers.

However, the nature of collective action is particularly complex and is influenced by a number of factors. There are competing explanations for determinants of collective action and this section of the thesis may not exhaust all of them. Collective action or the formation of associations or groups may be voluntary or induced by a third party through coercion. In this thesis, the focus is on groups formed voluntarily hence the literature review will be limited to the determinants of voluntary membership in a group/association. Often collective action can be measured indirectly. Collective action is influenced by the institutional structure in which the community is embedded which includes government policies, cultural religious values, social capital, ethnicity, property rights structure, etc. Therefore, an institutional analysis of the local structure is essential to be able to identify determinants of collective action (Gebremedhin *et al.,* 2002).

Collective action will occur where a common problem exists and the cost of providing the collective good incurred by each member is lower when provide by a group rather than an individual. Collective action occurs at different levels and collective action at one level influences collective action at other levels. Interaction between levels determines collective action outcomes (Pokharel *et al.*, 2002). A number of studies indicate that collective action outcomes are at least partly determined by incentive structures. The size of the group and the characteristics of the group experiencing the common problem as well as the constraints faced by the group's individual members will influence the incentives. Incentives are greater in smaller

groups than in large groups. In small groups, members are able to monitor what others are doing, which is difficult in large groups (Olson, 1965).

Previous research has identified four factors that influence participation in groups. These are trust, cooperation, direct utility from associations, population density (Alesina & La Ferrara, 2000; Alesina & La Ferrara, 2002). Some studies show a strong link between social capital and collective action (Glaeser *et al.*, 2001). The concept of social capital is closely related to collective action and is often taken as an indicator of capacity for collective action or at least is hypothesized to be an important determinant. However, in general, it can be said that monitoring costs, transaction costs and leadership are important community factors determining collective action and its impact.

3.2.4 Transaction costs and market participation in select countries

A number of studies have attempted to address the question of transaction costs in market participation (e.g. Von Braun *et al.*, 1991; Staal *et al.*, 1997; Omamo, 1998; Key *et al.*, 2000; Lapar *et al.*, 2003; Maltsoglou & Tanyeri-Abur, 2005). The role of transaction costs in farmer market participation patterns have been discussed in some country specific examples. The major findings are that market participation declines as a result of inhibitive transaction costs. A low proportion of products exchanged in the market reflects the existence of high transaction costs (Staal *et al.*, 1997; Lapar *et al.*, 2003). The basis is that transaction costs affect price, which in turn affects quantity of output traded. The bottom line is that transaction costs tend to reduce the net benefits of exchange and when that happens, smallholder farmers will stop participation. Therefore transaction costs are considered to be negatively related to market participation (Von Braun *et al.*, 1991). Market participation by smallholder farmers is also not uniform because households may face different transaction costs to market participation (Omamo, 1998; Key *et al.*, 2000).

Sartorius (2003) did a study on linking small-scale farmers to agribusiness focusing on the economics of contracting. He applied the new institutional economic theory and a case study methodology to design a proposed contracting model. The study findings revealed, among other

things, that the institution of contracting has allowed large numbers of small-scale farmers to overcome the barriers to entry to certain industrial crops. From these findings, a series of proposals for the design of a smallholder agribusiness contract farming model were then developed. The proposed model was developed based on the assumption that a smallholder contracting arrangement can be treated as a strategic investment decision. A key feature of the model is the use of activity based costing in order to trace differential transaction costs to the contracted farmers. This way, the model is able to highlight the differential cost of smallholder contracting or the cost savings of a farmer group or association. The identification and quantification of incremental transaction costs associated with smallholder farmers can be used by agribusinesses to lobby for state assistance with start-up capital or alternatively to charge back incremental costs to the contracted growers. Sartorius (2003) concluded that smallholder farmers can be linked to agribusinesses on an economic basis but only if measures are taken to reduce incremental transaction costs.

Staal *et al.* (1997) looked at milk production and marketing failure in Kenya and Ethiopia. The authors found that transaction costs heavily impact and impede commercial production of milk in the study areas. In this context, when institutions are effectively managed they can reduce the toll of transaction costs for both the producers and buyers.

Staatz (1987) used concepts from transaction costs economics to examine conditions under which collective action is likely to take the form of farmer-owned cooperatives and offer advantages to farmers. His findings were that benefits of cooperatives over farmer associations derive from the asset fixity principle (i.e. fixity of both physical and human assets). Farmers do not form or join cooperatives only for the sake of reducing transaction costs; an additional motivation is to distribute rights in the farmers' favour. Cooperatives also avoid opportunistic behaviour by trading partners. In many cases, even with strong farmer associations, it is more costly for farmers to try to enforce contracts with other firms than to internalize the transaction by integrating forward through the creation of their own cooperative firm. Hill and Kim (1988) used a transaction costs model to explain the transition between two distinct governance modes for serving a foreign market. They concluded that economizing on transaction costs through contracting results in economic benefits.

Goetz (1992) studied the impact of transaction costs in the coarse grain market in Senegal and found that better information raises the probability of market participation. She used a range of factors to reflect the effect of transaction costs on the market participation in coarse grain, both for buying and selling. The factors included proxy variables for fixed transaction costs, which included ownership of carts for transporting grain to the market, distance from the market and regional dummy variables. Gabre-Madhin (1999) investigated the effects of transaction costs on grain trading in Ethiopia. His study focused on the transaction costs in the choice of market institutions such as grain brokers. 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 collective action reduces the use of brokers. He concluded that search costs can considerably constrain grain traders.

Sanginga *et al.* (2004) highlighted the key steps and procedures in building capacity among farmers, farmers' groups, and communities, to identify and evaluate market opportunities, develop profitable agro enterprise, and intensify production, while sustaining the resources upon which livelihoods depend. In this study, an approach known as Participatory Market Research (PMR), a component of the Enabling Rural Innovation (ERI) initiative was used. This approach is a community-based approach in which rural communities become active partners in identifying market opportunities and developing profitable agro enterprises. It is based on a territorial approach to agro enterprise development, in which options are selected by rural communities based on their assets and opportunities.

Maltsoglou and Tanyeri-Abur (2005) studied the impact of transaction costs on the degree of household market integration using survey data from smallholder potato producers in the Peruvian Andres. The analysis focused on the impact of transaction costs differentiated as information, negotiation and monitoring costs. Sales volumes and sales in large markets were used as proxies for market integration. The results showed that information, negotiation and monitoring costs affected market integration, in addition to transport costs and market prices.

Generally, there are always some transaction costs attached to any sale or purchase but the greater the degree of organization in the market, the lower the transaction costs. Hence the importance of finding ways of reducing transaction costs involved in integrating smallholder farmers to markets.

3.3 Other factors influencing market participation by smallholder farmers

A study on market participation choice by smallholder staple cereals producers (Barrett, 2008) and another on factors influencing smallholder farmers' market participation using wealth-ranking factors in northern Mozambique (Green *et al.,* 2006) showed that private household assets, especially land, livestock, labour, equipment are strongly positively associated with market participation. Those households with access to adequate assets and infrastructure and faced with appropriate incentives engage actively in markets, while those who lack one or more of those three essential ingredients largely do not. Barrett (2008) also found that there are strong associations between households' asset holdings and geographical factors such as market access and agro-ecological zones and household market participation. Wealthier households and those cultivating in higher potential agro-ecological zones appeared much more likely to participate in the market than other households. Another finding from the same study was that transaction costs associated with weak institutional and physical infrastructure were substantial and appeared to distort production and marketing behaviour significantly, muting the effects of price policy and causing considerable social inefficiency.

A household's production technology choices affect its market participation choices by affecting its productivity (Barrett, 2008). Technology directly affects market participation in that the productivity of a household greatly influences its net marketable surplus. Improved production technologies therefore provide a reliable driver of increased market participation.

Distance from the farm to point of sale, and market information were found in a couple of studies to be major constraints to the intensity of market participation (Goetz, 1992; Montshwe, 2006; Bahta & Bauer, 2007; Omiti *et al.,* 2009). Omiti *et al.* (2009) also found that for sales to increase, output price was a key incentive. In addition to distance and access to market

information, Montshwe (2006) concludes that to increase farmer participation in mainstream markets, farmer training in issues pertaining to production and marketing was crucial. These findings indicate that market information delivery systems must be strengthened, roads upgraded, retail outlets with improved market facilities be established in remote rural villages and farmers be trained in production and marketing issues if market participation was to be improved.

Goetz (1992), Holloway *et al.* (2000a), Makhura (2001) and Lapar *et al.* (2003) confirm some of the findings in Barrett (2008) that ownership of assets, better access to information and access to technology are important in stimulating farmer market participation. Holloway *et al.* (2000a) sought to identify alternative techniques for promoting market participation among peri-urban milk producers in the Ethiopian highlands. Their study concluded 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. A further finding was that by locating producers, the time required to market milk was minimised and this increased the number of participating producers and the level of marketable surplus.

Lapar *et al.* (2003) highlighted that the inability of smallholder producers to take advantage of economies of scale in production and marketing impedes their market participation. Umbrella policies such as price supports are often biased towards large scale producers because such policies usually favour physically and financially capital-intensive production systems.

CHAPTER 4

STRATEGIES FOR IMPROVING MARKET PARTICIPATION OF SMALLHOLDER FARMERS

4.1 Introduction

This chapter presents a review of the strategies for improving market participation of smallholder producers. Smallholder farmers in sub-Saharan Africa are primarily involved in two types of markets: spot markets and markets where credit and output markets are linked through some form of contracts. Any strategies to promote market participation of smallholder farmers should take account of smallholder farmers' constraints to access these markets. Just getting prices right is not enough to induce welfare-enhancing market participation. Smallholder farmers must have access to productive technologies and adequate private and public goods in order to produce a marketable surplus. What is important is to get institutions and endowments, as well as prices, right in order to induce market-based development (Barrett, 2008). The purpose of this chapter is to inform the selection of the best strategy to improve market participation by smallholder farmers.

4.2 Food aid for market development

Abdulai *et al*. (2004) studied the possibility of using food aid to stimulate agricultural markets and poverty reduction in sub-Saharan Africa, with a focus on stimulating smallholder and trader investment in marketing and processing capacity. They found that food aid can be used as a domestic market development tool if the recipient countries have a conducive domestic political and institutional environment. Food aid often plays a significant off-setting role in relieving constraints that otherwise limit productivity in smallholder systems. There are, however, obvious risks to using food aid for market development. Because food aid expands local food supply, it needs to be well targeted if adverse producer price effects are to be avoided. One way food aid for market development works is as follows: donors provide raw materials such as maize grain to recipient country governments or non-governmental organizations (NGOs) for free. These raw materials are then given or sold to local processors or traders who then process

and sell the product, creating or expanding new markets in the process. If the commodities are sold, the government or NGO then uses the counterpart funds generated by food aid to support the development of the production, processing and marketing activities by smallholder farmers (e.g. through technical assistance projects or public infrastructure investments (Abdulai *et al*., 2004). The objective of such support is to stimulate local production, processing and distribution capacity expansion with the aim of replacing food aid with domestic production.

4.3 Rural institutions for collective action to improve market participation

Market supporting institutions and producer marketing groups (PMGs) have been found to be important in enhancing the market opportunities of smallholder farmers through better coordination of production and marketing functions, and facilitating contracts with market agents along a value chain. They can provide essential market power to smallholder producers. If markets are to effectively serve smallholder farmers and the rural poor, it is important to strengthen supporting institutions that promote competition and establish mechanisms for formation and enforcement of contracts. Collective action can be an important strategy to strengthen market supporting institutions in rural areas. Under enabling conditions, the PMGs and similar farmer organizations can facilitate market access to smallholder farmers through horizontal and vertical coordination of production and marketing activities. They can help shorten the long and complex marketing channels that prevail in many rural input and output markets by directly linking smallholder farmers with the upper end of the value chain. This can help reduce transaction costs and increase the share of the consumer price reaching smallholder producers (Obare *et al*., 2006).

Farmer organizations and cooperatives that facilitate business opportunities are evolving in many African countries (e.g. Cameroon, Ethiopia, Ghana, Kenya, Malawi, Mali and Zambia). Ten PMGs were formed between 2002 and 2003 in two of Kenya's semi-arid districts of Mbeere and Makueni. The formation of the PMGs was facilitated by ICRISAT and partners and was based on a voluntary membership and clear commitments from the members. No financial incentives were provided other than access to improved technologies and institutional support for group activities. As was permitted under Kenyan law, the PMGs were formally registered as welfare

societies. They had well-defined objectives, by-laws, and an elected body that led the group on behalf of the members. Their objectives went beyond social welfare and included better access to markets, technologies and inputs at affordable prices; better prices for local produce; and development of business skills for commercialization of production. An impact assessment study of smallholder marketing in these districts conducted in 2005 found that the PMGs had offered attractive marketing outlets for smallholder producers and the PMGs were able to bulk the grain and sell it to buyers beyond the village at prices better than those paid by brokers and middlemen (Obare *et al*., 2006).

4.4 Contract farming

Contract farming has over the years been considered as one system that has considerable potential for providing a way to integrate smallholder farmers in developing countries into export and processing markets and into the modern economy. The history of contract farming dates back as early as 1885, when the Japanese employed contracting to secure sugar production in Taiwan (Rehber, 1998) and by the United States multinationals in Central America at the beginning of the 20th century as a result of state pressure and domestic labour militancy (Clapp, 1994). In Africa, contract farming is believed to help farmers by providing new technology, ready markets and secured inputs and prices. Further, contract farming offers a mechanism that ensures self-sustained development (Glover, 1987; Weatherspoon *et al*., 2001). Contract farming has also been a component of the most successful income generating projects for smallholder farmers, as well as an important earner of foreign exchange in developing countries. This is despite strong criticism that contract farming is just another form of exploitation with limited equity impact, increasing socio-economic differences and evidence of some unsuccessful schemes and problems for many outgrowers (Glover, 1987).

4.4.1 What is a farming contract?

A farming contract is defined as an agreement between farmers and processing or marketing firms for production and supply of agricultural products, often at specified prices, quantities, and quality levels. The key feature of farming contracts is that they provide a framework for

developing a relationship between farmers and processors. Contracts provide the basis for sharing value, risk, and decision-making power between farmers and processors in a way that is mutually beneficial (Eaton & Shepherd, 2001). In contract farming, farmers agree with processors, through either formal or informal contracts, to limit their production and marketing behaviour in return for some level of service provision and purchase guarantee from the processor. Unlike spot market trading, the agreed exchange is in promised goods and services rather than in already produced goods and services. These arrangements are best viewed as a response to widespread failure of input and credit markets and to poor or absent service provision. In addition to the need to ensure sufficient volume of purchases to reduce unit processing costs, concerns about product quality significantly affect the structure of these relationships (Benfica *et al.*, 2002). Contracts tend to work better where markets are stable and greater demands for quality and coordination exist in the value chain. If production is less specialized and relatively undifferentiated, contracts may be suboptimal, compared with market forms of procurement, due to high levels of transaction costs in coordinating smallholder producers.

Contract farming in developing countries often involves a range of participants in addition to the agribusiness firm and the contracted farmer. These parties both foreign and local could include host government, parastatals, international aid organizations, donor agencies and the World Bank. The integrated partner could also be a village level processor or home level processor and growers can range from subsistence farmers to highly capitalized farmers. Furthermore the majority of contracting companies in Africa have involved the host governments as partners and the incidence of pure private sector contracting is rare (Little & Watts, 1994).

Contract farming has the potential to link farmers to markets and stimulate agricultural production in the face of globalization. Also, it serves to fill in the void left by governments in the wake of market deregulation under Structural Adjustment Programs by providing access to inputs, technologies, credit and other services. Due to its immense potential, it has been given a central role in the latest strategy by the New Partnership for Africa's Development (NEPAD) to revive the continent's agriculture (NEPAD, 2006).

Several contractual models exist, which can be modified by the involvement of commodity brokers, transporters, input suppliers, financial institutions and providers of grain storage facilities. They include the following;

(a) Cash spot, open or arms-length markets

These are the simplest form of vertical coordination. Transactions are coordinated by prices only and there is no continuing obligation among those engaging in them. There are no legal/court interventions if farmers walk away from the deal. For markets where the conditions resemble perfect competition (i.e. many buyers and sellers, homogeneous products, perfect information, etc.), spot markets can be efficient coordination mechanisms. Spot markets typically govern the supply chains for agricultural commodities. Under these circumstances, farmers sell to commodity buyers or consumers without formal future delivery contracts. Farmers and commodity buyers are free to bargain or not to bargain as they please before the transaction (Masten, 1991). The advantage of cash spot markets is that they are flexible for dealing with unforeseen changes in weather, yield, prices and policy changes. The disadvantages include, among others, that there are no incentives for farmers to maintain or improve product quality. Consequently, it is important to provide each farmer with incentives to produce high-quality grain.

(b) Market specification contracts

This type of contract establishes the amount, time, quality and place for future deliveries and payment. The price may be established at the time the contract is made and the contract is then called a forward contract. In some cases, the price is determined at the time of shipment or delivery by some pre-agreed formula. One of the benefits of such contracts is that they define the range of acceptable behaviour and limit free riding. The purchaser is assured of volume of supply and uniform product quality. Other benefits of market specification contracts include the following: farmers reduce their price risks since hold up problems and costly bargaining are reduced as terms of trade are stipulated *ex ante*; and that compatible incentives are provided. Disadvantages, however, include the following: farmers and buyers face the risk reneging on the

agreement, such as, difficulty in knowing whether failure to meet contract terms is due to natural causes such as drought, pests, etc. or lack of effort on the farmer's part; contract enforcement requires monitoring which can be costly (e.g. legal costs); and these contracts are not flexible, closing the door for other emerging opportunities and hence attracting opportunity to cheat on the agreement.

(c) Production management contracts

This type of contract specifies that the buyer will provide inputs and/or cultural practices and the farmer will deliver products after harvest. In a typical production contract, the commodity buyer owns marketing, processing and input technologies, and markets inputs to farmers through private "care-taking" contracts. Farmers under contract receive inputs and information on their use through all stages of production and marketing. The main benefit is that companies offering contracts are assured of supply and uniform product quality. Farmers benefit from reduced price risks. The costs to the company is uncertainty of getting delivery of the crop after harvest and high monitoring costs to ensure that farmers comply with the terms of the contract. Costs to the farmer are that these contracts are complex and it is difficult for farmers to evaluate the benefits from production contracts, as they are not readily noticeable.

(d) Resource providing contracts

This type of contract specifies the buyer to provide most inputs and pay the farmer on a piece basis with no direct relationship to the market price. Benefits to the company include reduced capital and labour inputs; economies of scale; greater control and superior access to information because residual rights are conferred to owners and non-owners cannot withhold assets from production. The benefits to the farmer include risk reduction and full insurance because they receive a fixed salary irrespective of output. The costs to the company include low incentives for farmers to increase effort because they are paid on fixed terms; and high administration and monitoring costs.

4.4.2 Use of farming contracts to promote smallholder farmer market participation in Zimbabwe

The government of Zimbabwe made efforts towards promoting participation of smallholder farmers in markets, particularly through contracts. Recently, the government of Zimbabwe explicitly targeted contract farming as well as farmer commodity association development under the National Economic Revival Programme (NERP) launched in 2003. Accordingly, the government pledged to facilitate agro-processors and seed houses to enter into seasonal contracts with farmers; establish a unit within the Ministry of Lands, Agriculture and Rural Resettlement to promote fulfilment of such contracts; and spearhead the development of new farmer commodity associations which would provide leadership over contract farming as well as technical and marketing support to smallholder farmers. Contract farming, however, had been part of the agricultural landscape in Zimbabwe since the 1950s and continues to be practised in both crop and livestock sectors. Contract farming uses various mechanisms such as verbal agreements, registrations, memoranda of understanding and actual contracts. In an effort to strengthen the land reform programme of Zimbabwe, the Zimbabwean government concluded Memoranda of Understanding with several agribusiness firms to facilitate linkages between smallholder farmers and agribusiness and facilitate access of smallholder farmers to much needed inputs (Woodend, 2003).

Besides contract farming, smallholder farmers have the option of participating in spot markets. Spot markets involve no contractual obligations before or after sale of a commodity. They also have no or few requirements in relation to quality or quantity. These markets are flexible implying low barriers to entry, but also high transaction costs due to search costs and the uncertainty involved (Boughton *et al*., 2007). Spot markets therefore have low unit returns for smallholder farmers because of high transaction costs and low barriers to entry.

In view of the disadvantages that smallholder farmers have due to poor access to information and extension services, poor adoption of technologies that could potentially increase productivity, poor infrastructure and low returns in spot markets, it is therefore important for government and the private sector to play their roles in providing appropriate policy interventions and favourable

conditions in the context of contract farming to improve the commercial future of smallholder farmers. Simply put, if the asset poor are unlikely to participate actively in commercial markets, particularly contract markets which offer greater expected returns, then efforts to stimulate increased smallholder agricultural commercialization may fail without complementary efforts to increase household wealth (Boughton *et al*., 2007).

4.4.3 Commodity characteristics that favour contracting

Contract farming requires a crop that has few buyers and whose processing and/marketing is very sophisticated to avoid side marketing. With a lot of competition among buyers, it becomes difficult to enforce contracts because of the problem of side marketing. Sorghum and millet are in the category of crops that have many buyers. The main reasons why food crops such as sorghum and millet are generally not contracted are that they are of relatively low value and high risk to the contractor due to widespread household retention for food and ubiquitous opportunities for side selling (Woodend, 2003). However, sorghum and millet have specific characteristics that favour contracting, for example, their processing is complex and requires specialized equipment and their finished product requires specialty marketing to reach the target consumers as a specialty product. Production of volumes that justify investments in transportation and other administration activities involved in contracting is a key factor.

4.5 Cooperatives and smallholder market participation

Cooperatives are useful in overcoming access barriers to assets, information, services, and indeed, the markets within which smallholder farmers wish to sell their commodities. Like contract farming, producer cooperatives can offer marketers the advantage of an assured supply of the commodity at known intervals at a fixed price and a controlled quality. They can also provide the option of making collateralized loans to smallholder farmers. Such arrangements eliminate the principal-agent issues faced by outgrower schemes in monitoring effort by individual producers, providing better relations with local communities, avoiding the expense and risk of investing in such enterprises, sharing production risk with the farmer, and helping ensure that farmers provide produce of a consistent quality (Grosh, 1994; Delgado, 1999).

Cooperatives are, however, different from contract farming with respect to negotiations among different partners. In cooperatives, the members themselves, collectively, have the power to hold management accountable. The degree of moral hazard seems to be greater if cooperatives are general in their orientations rather than created for specific purposes. An example of successful cooperatives created for a specific purpose is the farmer-run local milk marketing cooperatives in Ethiopia. In Ethiopia, the milk production system comprises small rural and peri-urban smallholder farmers who milk local breeds. One of the principal outlets for milk are 'milk groups', which are milk marketing cooperatives established by the Ethiopian Ministry of Agriculture's Smallholder Dairy Development Project (SDDP) with the support of the Finnish International Development Association. The milk groups buy milk from both members and non-members, process it, and sell the derivative products to traders and local consumers. Although the milk groups sometimes sell fluid milk products such as sour milk, skim milk, or buttermilk, most of their revenue is generated by sales of processed dairy products, such as butter and cottage cheese (Holloway *et al*., 2000b).

4.6 Micro-small enterprises and smallholder farmer market participation

A Swiss international NGO, Intercooperation, tested different approaches to market development in Bangladesh since 2004. The first two types of participative market research were known as the Marketing Extension tool and the Economic Technical Feasibility. These were applied through the Community Based Organisations (CBOs) with an aim to enhance livelihood opportunities. The main objective of the marketing extension tool is to empower the CBOs to identify and exploit market opportunities by increasing their capacity to make independent investigations. Participants are taught how to select and enhance income-generating activities that are relevant to their specific situations. The Economic Technical Feasibility refers to a simple economic analysis of one or two possible income generating activities that could be performed by CBO members. A focus group discussion with interested members is conducted, at which members learn to do a simple cost/benefit calculation of the selected activities. In this case, no market investigation is applied.

In applying these two participative market research tools, participants tried different approaches to marketing, such as forming cooperatives, improving product quality and seeking sustainable linkage with large buyers. Group members accumulated business knowledge in the areas of marketing, supply and demand, quality and profitability. A further step was introduced to help develop micro-small enterprises (MSEs). There was a need for smallholder producers to understand the value chain in order to learn how to make good marketing decisions based on business principles. The MSEs took many forms, namely, family businesses, group marketing clusters, specialized producer networks and associations. Intercooperation has been able to provide a variety of support specific to the needs of the new MSEs. Their support has allowed the groups to gain expertise in their domain and facilitate further growth (Intercooperation, 2008).

CHAPTER 5

DATA SOURCES AND CHARACTERISTICS OF THE SAMPLE

5.1 Introduction

This chapter describes the sources of data used in this study, the study areas, the sampling procedure and data collection methods. This chapter also gives a detailed description of the socio-economic characteristics of the sampled households to give an understanding of the type of communities that were studied.

5.2 Data sources

The data used in the analysis were obtained from both primary and secondary sources. The research was targeted at smallholder communal farmer households in the Limpopo river basin in Zimbabwe.

5.2.1 Primary data

Primary data was collected from smallholder communal sorghum and millet producers (a mix of grain sellers and buyers), some of whom already are involved in marketing sorghum and millet at different scales of operation, and processors and other commodity firms who are currently buying from these farmers. Research was conducted in two phases. The first phase involved a reconnaissance survey after which a formal survey was conducted. The reconnaissance survey involved use of a checklist with the different firms/companies while the formal survey involved administration of structured questionnaires. Due to the relatively high illiteracy levels among smallholder farmers and lack of records at the farm level, interviewing was seen as the best data collection method since these farmers' ability to respond to a mail questionnaire was limited. The questionnaire took about forty-five minutes to administer. The intention was to interview household heads. In cases where household heads were not available, a knowledgeable adult household member could be interviewed. Such cases were rare as appointments were made before the day of the interviews. A total of 195 households were interviewed in the two districts.

Data from farmers comprised household characteristics like status of household, age of household head, educational level attained by household head and five major household income sources; types of crops grown, area under each crop, production levels by crop, major challenges in sorghum and millet production; numbers by type of livestock owned; membership to farmer groups/associations; extent of market participation in terms of grain quantities sold, road access, major grain buyers, main sources of marketing information, existing production and marketing contracting arrangements, and constraints to both production and marketing.

Enumerators to assist in data collection were thoroughly trained prior to commencement of the exercise. The enumerators used were competent in the languages spoken in the sampled villages. They also had extensive experience of conducting surveys in Zimbabwe and part of the team commonly used by ICRISAT in its surveys.

Among districts that fall in the Limpopo river basin, three districts were purposively selected based on the following criteria (i) sorghum and millet are widely grown, (ii) ICRISAT already has ongoing projects, such as conservation agriculture projects and on-farm trials for various crops including sorghum and millet, and (iii) some farmers are already selling their produce[3]. The selected districts were Matobo, Gwanda and Chiredzi. All the three districts underwent a reconnaissance survey. However, due to similarities in farming practices among farmers in these districts and proximity to ICRISAT location, only Matobo and Gwanda were included in the formal survey while Chiredzi, the furthest from ICRISAT, was dropped in the formal survey.

Within the two selected districts are administrative wards where ICRISAT's ongoing projects are located, namely, Beula and Silebuho wards in Matobo, and wards 8 and 15 in Gwanda. In each ward, two villages were randomly selected. This required sampling frames listing all villages in each district. The sampling frames were obtained from local agricultural extension officers. The third and final stage of the sampling procedure was selection of the actual respondents. Household listings were used as sampling frames. These were provided by the local/traditional

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[3] This thesis research, funded by ICRISAT, is part of a bigger Challenge Program on Water and Food Project 1 that ICRISAT is undertaking in various districts on the Limpopo river basin. The study therefore had to be conducted in districts where ICRISAT is already working.

leadership. Traditional leaders normally keep records of the households in their respective villages. Household listings for the selected villages were requested from each of the traditional village leaders. The lists were verified to ensure they were as exhaustive as possible. All the households on the list were numbered and SPSS was used to pick a random sample of twenty-five (25) farmers from each village. The author's previous village research experience has shown that a village has an average of 250 households. Twenty five farmers constituted a tenth of the population. Since an unrestricted random sampling was being used, each household had an equal probability of being included in the sample; the sample is considered representative of the population according to socio-economic theory of sampling methods (Medhi, 1996; Agrawal, 2003). This sampling method was used since data on the population variance and mean was unavailable for the population intended to be studied and will obtain the highest possible precision of sample estimates within the available time and budget. An additional five households per village were selected as reserves in case some of the selected households would not be available on the day of the interviews. Table 3 shows the districts, wards, villages and sample sizes selected for the survey.

Table 3: Districts, wards and villages selected for the study

District	Ward	Village	Number of respondents
Gwanda	Ward 8	Sitezi	23
		Sizeze	26
	Ward 15	Zwabagwamba	26
		Thibeli	24
Total respondents			**99**
Matobo	Silebuho	Manuka	26
		Lubhangwe	24
	Beula	Ntabansimbi	22
		Khapheni	24
Total respondents			**96**

Stratified random sampling was used to select from existing feed, food and brewery industries; commodity brokers, financial institutions, agricultural retailers, NGOs and seed houses that source their raw material from smallholder farmers. This sampling method ensured that the different groups are represented in the sample. Initially, all stockfeed, food and brewery industries; financial and seed houses; retailers; and NGOs; in the survey districts and in

Bulawayo and Harare were listed. Two firms were then chosen randomly from each stratum for interviews. The number of firms per stratum was limited by the budget and time available for the interviews. Table 4 shows the assortment of companies that were visited. These companies are involved in sorghum and millet one way or another in their day-to-day business.

Table 4: Companies visited by type of business and location in Zimbabwe, 2008

Industry	Company name	Location
Grain trading	Grain Marketing Board	Chiredzi
Food milling		Bulawayo
Agricultural retailer	Farm & City Centre	Bulawayo
Food milling	National Foods (Sorghum meal production)	Harare
Stockfeed milling	Agrifoods	Bulawayo
	National Foods (Stockfeed production)	Bulawayo
Brewery	Chibuku Breweries	Chiredzi
		Bulawayo
	Ingwebu Breweries	Bulawayo
Finance	AGRIBANK	Bulawayo
	CBZ Limited (Agribusiness unit)	Harare
Commodity broker	Origen Agriculture/Staywel	Harare
Seed house	Agricultural Seeds and Services	Harare
	Pannar Seeds	Harare
NGO	Lutheran Development Services	Bulawayo
	Care International in Zimbabwe	Harare

Throughout the course of the reconnaissance survey, the various agribusiness institutions were interviewed regarding their support to smallholder small grain producers, the agro-industry, or both. Information about current supplies of small grains, the likelihood of increased usage of sorghum and millet as raw materials, constraints or challenges in dealing with smallholder farmers as suppliers and policy implications to utilization of sorghum and millet was collected. The following was also explored in some detail:

- The nature of the current relationships between the agribusiness firms and the smallholder sorghum and millet producers;

- The types of assistance, if any, those firms provide for the smallholder farmers. How significant has that assistance been in the farmers' decision to market and in the success of the various marketing arrangements?

At the end of each interview, a discussion on alternative institutional arrangements and government policies aimed at strengthening links between agribusiness firms and the smallholder sector, particularly small grains production and marketing, was carried out with each selected firm. This information was aimed at providing guidelines for recommendations on how market participation of smallholder farmers can be enhanced. To complement the interviews with firms, two major sorghum producers in Chiredzi district were interviewed. This was done to show some success stories and great potential that exists in communal areas for enhancing sorghum and millet marketing.

5.2.1.1 Description of the selected districts

(a) Chiredzi district

Chiredzi is one of the districts in the south-eastern lowveld of Zimbabwe characterized by highly variable mean annual rainfall of 400mm. The growing season is less than 90 days, making it unsuitable for rain-fed cropping. Most of the communal areas are located close to Gonarezhou National park and conservancies thereby increasing the human, wildlife and livestock conflicts. The livestock wildlife interactions have meant the district is very susceptible to foot and mouth disease (FMD) outbreaks. The district also has smallholder irrigation schemes.

(b) Gwanda district

Gwanda district is located in the south-west of Zimbabwe in Matabeleland South province. The economy of the district is dominated by agriculture with some gold and cement mining to the north of the district. The district is in agro-ecological region five characterized by very low (400mm or less per year) erratic rainfall with periodic seasonal droughts and dry spells during the season.

(c) Matobo district

Matobo district is divided into two in terms of agro-ecological potential. The southern half of the district is located in agro-ecological region five with annual rainfall of 400mm or less. The northern half of the district is located in agro-ecological region four and has relatively higher rainfall, 450 to 650 per annum, compared to the southern half. The district borders a national park in the northern corner. Craft making is an important source of livelihood for the households in the north. Agriculture is the main source of livelihood with the south having higher potential for livestock and the north with potential for both cropping and livestock. The south (drier half) therefore grows more small grains than its northern counterpart.

5.2.2 Secondary data

Secondary data were obtained from the large volume of literature on farmer participation in markets and from company records. Secondary information included existing marketing arrangements with farmers for different commodity crops, volumes[4] of sorghum and/millet that the companies handle overtime and FAO per capita cereal consumption data. The purpose of the secondary data was to learn lessons from successful marketing arrangements on other crops and draw recommendations for improving farmer participation in the marketing of sorghum and millet. The per capita cereal intake data were used to compute a cereal balance sheet for the studied households.

5.3 Characteristics of the sample

Household characteristics are important determinants of economic activities, livelihood strategies and decisions undertaken by households. They are also important in assessing the vulnerability of different households to economic, political and socio-psycho-cultural shocks. Specifically for this study, an understanding of household characteristics will be useful in crafting

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[4] Data on volumes of sorghum and millet handled by the different companies overtime was collected. However, permission to include the statistics in this thesis was not granted as the companies regard their information with high confidentiality.

recommendation domains for the marketing approaches to be promoted for the small volumes of small grains they produce. The key household characteristics investigated were; size of the households, gender and age of household heads, literacy level of household heads and membership to farmer associations.

Table 5 shows the description of households by district and status of households. More than 50 percent of the sampled households were male headed in both districts. A considerable proportion of the sampled household heads (over 30 percent in both districts) were over 60 years of age. The majority of them (62 percent) are male heads. These high proportions give an indication of an aging agricultural labour force, which is less ambitious compared to their younger counterparts and may have little interest in market participation since their primary focus is food security.
There is a high literacy level of more than 80 percent among household heads in the surveyed districts. Literacy level of the household head is important in as far as it affects assessment and adoption of new technologies and marketing decision–making by smallholder farmers. Male heads had higher literacy levels when compared to female heads, even if the difference was not significant. Although male heads had a higher proportion of the illiterate, among household heads with at least primary education more than 50 percent were male heads. Historically the girl child has been disadvantaged as priority on resources allocated for educational purposes has been placed on males. Literate farmers are highly receptive to new ideas; therefore male headed households are likely to participate more in markets than their female counterparts when only literacy is considered.

The average household size is seven for both districts. Most resident household members worked full time on the farm. Household size, if taken as a proxy for availability of labour resources, shows that households would not have a serious problem of farm labour and are likely to adopt labour intensive technologies when only labour resources are considered. From the whole sample, female headed households had smaller household sizes (six members) compared to male headed households (seven members).

About 41 percent of the interviewed households in both districts were members of farmer groups/institutions in their area. This is a significant proportion indicating recognition of the

importance of collective action within farming communities. Of these, 41 percent were female headed while 59 percent were male headed households.

Table 5: Characteristics of sampled households by district and gender of household head[5]

Variable	Description	District		Household status	
		Gwanda	Matobo	Male headed	Female headed
Sample size	Number of respondents	99	96		
Household headship	Male head (%)	63	53	58	42
	De jure female head (%)	21	25		
	De facto female head (%)	16	22		
Age	Age of household head (%)				
	21-30 years	6	6	58	42
	31-40 years	16	12	48	52
	41-50 years	31	19	55	45
	51-60 years	16	21	61	39
	>60 years	30	43	62	38
Education	Highest education level attained by household head (%)				
	Illiterate	12	9	57	43
	Primary	41	49	58	42
	Secondary	38	40	55	45
	Advanced/Tertiary	6	2	75	25
Labour	Mean household size	6.5	7.1	7.0	6.0
Institutions	Membership to farmer groups/associations (%)	41	41	59	41

More than 40 percent of the interviewed households were female headed. Migration, a key driver of the socio-economic situation, with perceived employment opportunities in urban areas and neighbouring countries stimulating movement of people, particularly men, explains this trend. In both districts, for example, people migrate to South Africa and Botswana in search of jobs. This has resulted in a number of socio-economic changes in households. In at least 16 percent of the households, women take full responsibility for household issues while men seek employment (*defacto* female headed households) (confirmed in the CPWFP1 Baseline report, 2007).

The proportion of *dejure* female heads (21 percent in Gwanda and 25 percent in Matobo) is due largely to the impact of HIV/AIDS, which has led to death of mostly male heads migrating

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[5] *De facto* female headed households are defined as those who have a male component, but temporarily absent.
De jure female headed households are those without a male component (never married, divorced, single, widows)

between countries in search of employment leaving women to run the day-to-day affairs of the family; besides those women who never married or are divorced.

5.3.1 Crop production

The six major crops grown varied by district (Table 6). In Gwanda district, sorghum was the most planted crop (96 percent), followed by maize (91 percent), groundnuts (87 percent), bambaranuts and cowpeas (each 64 percent), and millet (53 percent). Matobo district had groundnuts as the most common crop (95 percent). Sorghum, millet and bambaranuts were the second (94 percent) and third (87 percent) most planted crops in Matobo, followed by maize and cowpeas. Millet was more common in Matobo when compared to Gwanda. This is because the surveyed part of Matobo district (south half) is much drier than Gwanda and the majority of inhabitants are of the Khalanga tribe whose traditional staple grain has always been millet. Generally, the majority of interviewed farmers in both districts preferred sorghum to millet. This trend can be explained by the fact that sorghum is less prone to quelea birds attack, sorghum is easier to process than millet and also the colour and taste of sorghum meal is more preferred to millet meal. Most of the sorghum grown was red sorghum due to non-preference by quelea birds. Some individual farmers grew both white and red sorghum varieties. Both types of grain can be used for food and for opaque beer. Sorghum has been the basis of traditional African beers.

Table 6: Six major crops grown by sampled households

Crops	Households (%)	
	Gwanda	Matobo
Sorghum	96	94
Millet	53	87
Maize	91	84
Groundnuts	87	95
Cowpeas	64	64
Bambara nuts	64	87

5.3.1.1 Crop production for farmers from different age groups and different education levels

An analysis of the types of crops grown by farmers from different age groups shows that all age groups grow the same type of crops and there are no significant differences in the types of crops grown by all farmers. There is, however, a significant difference at one percent level of significance in the farmers who grew millet, groundnuts and bambaranuts by highest level of education attained.

Table 7 shows the average area under each type of crop for; 2004/05, 2005/06 and 2006/07 cropping seasons. Maize had the highest mean area, followed by sorghum and millet in Gwanda district while in Matobo, sorghum and millet were the highest with maize coming third on the list. This trend was because the drier part of Matobo district was surveyed and also because of the Khalanga people's millet growing tradition. This shows the importance of the three crops for food security particularly for smallholder farmers.

Table 7: Mean area (ha) under each crop in the sampled districts (2004/05-2006/07)

Crop	Area cultivated (ha)	
	Gwanda	**Matobo**
Sorghum	0.55 (1.05)	0.67 (1.28)
Millet	0.34 (1.13)	0.67 (1.40)
Maize	0.92 (2.11)	0.45 (0.83)
Groundnuts	0.24 (0.60)	0.25 (0.45)
Cowpeas	0.13 (0.36)	0.12 (0.34)
Bambaranuts	0.15 (0.39)	0.21 (0.57)

Figures in parenthesis are standard deviations

Between 2004 and 2007, maize had the highest mean crop production, followed by sorghum and millet (Table 8). These findings are consistent with those of previous studies that maize is preferred to small grains, although production levels are low for all the crops (FAO, 2004b). To

note is that the 2004/05 season was not a good season and it started late and this could be the explanation for low mean values since some households were not able to establish a crop.

Table 8: Mean total production for the sampled households (2004/05-2006/07 seasons) (N=195)

	Sorghum	**Millet**	**Maize**	**Groundnuts** (unshelled)	**Cowpeas** (shelled)	**Bambaranuts** (unshelled)
Mean total production (kg)	124 (122.78)	101 (176.38)	209 (362.74)	75 (187.84)	12 (24.98)	34 (48.17)

Figures in parenthesis are standard deviations

5.3.1.2 Constraints to sorghum and millet production

Farmers face constraints in the production of sorghum and millet, and the most commonly cited constraint was quelea birds (Table 9). The threat of quelea birds on white sorghum and millet has acted as a major deterrent to production of these crops. Drought and pests (such as armoured crickets and aphids, and grain storage pests) were cited as the second and third most common challenges, respectively, in the production of small grains. The fourth challenge was unavailability of seed. The country experienced a severe seed shortage in the 2004/05 season and most farmers had problems accessing the quantities and types of seed they required. Regarding small grains, certified seeds are generally inadequate because of the limited number of seed houses dealing with these crops. As a result some farmers use pure grain as seed and some use retained seed, which compromises germination rates hence low productivity of the crops.

Other constraints included eating and trampling of crops by elephants, witch weed occurrence, shortage of fertilizer, shortage of draft power, lack of farming equipment, shortage of manure and shortage of labour. Literature has shown that very few farmers practised any soil fertility improvement and this is confirmed by the low proportions of farmers who mentioned shortage of fertilizer and manure as a problem. This is primarily because of the limited rainfall received in the area.

Processing of small grains is also a complex and labour-intensive exercise and it has been another major disincentive to small grain production. Manual threshing of sorghum and millet produces dust that causes severe itching of the skin and this has discouraged many farmers from producing these crops.

Table 9: Challenges faced by sampled households in the production of sorghum and millet (% households)

Challenge	Total sample (N=195)	Gwanda (n=99)	Matobo (n=96)
Quelea birds	30	66	76
Drought	17	35	46
Pests	11	26	26
Seed unavailability	10	34	14
Elephants	10	-	50
Witch weed	8	6	30
Shortage of fertilizer	4	8	9
Shortage of draft power	4	12	8
Lack of farm equipment	2	8	2
Shortage of manure	2	5	2
Shortage of labour	2	8	1
Other[6]	2	7	2

5.3.2 Livestock production

In addition to crops, smallholder farmers' livelihood depends on livestock production. The low rainfall in the Limpopo river basin areas of Zimbabwe makes livestock production more viable than cropping. Cattle, donkeys, goats and chickens are the common livestock. Survey results show, however, that at least 40 percent of the households interviewed in both districts did not own any cattle and about 17 percent did not own donkeys (Table 10). This is an indication of the proportion of households without access to draft power in the studied areas. A higher proportion of Matobo households owned cattle and donkeys compared to Gwanda households.

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[6] "Other" encompasses grain sprouting, baboons, shortage of storage chemicals and itchy skin due to dust produced during threshing

At least 90 percent of households in both districts owned goats. Matobo district had the highest proportion (96 percent) of households owning goats. Twenty one percent of the households owned sheep. About 98 percent had chickens. The high proportion of chicken owners are partly due to non-governmental organisations like World Vision that have distributed chickens to vulnerable communities under the poverty alleviation and enhancement of rural livelihood strategies programs (CPWFP1, 2007). These initiatives significantly increased the proportion of households owning chickens despite New Castle disease threats. Goats, sheep and chickens are a common source of income for most rural households as they are easily traded. They are also an important source of meat, milk and manure.

There are important gender differences in the ownership and control of livestock. The ownership of cattle and donkeys was slightly skewed towards male headed households. Contrary to the case with cattle and donkeys, a higher proportion of female headed households owned goats compared to male headed households. The ownership of sheep and chickens was not significantly different across male and female headed households.

Table 10: Proportion of sampled households owning livestock by type, district and gender of household head

Type of livestock	Total sample (N=195)	District		Gender of household head	
		Gwanda (n=99)	Matobo (n=96)	Male headed (n=113)	Female headed (n=82)
Cattle	60	58	63	65	53
Donkeys	83	81	85	87	78
Goats	92	89	96	92	93
Sheep	21	17	25	27	12
Chickens	98	96	99	99	96

Table 11 shows mean numbers of livestock by district. The most reared type of livestock is goats. Gwanda district has a higher mean number of cattle than Matobo while the mean number of donkeys is the same for both districts. Both cattle and donkey figures indicate a relatively adequate availability of draft power in these districts, which could be exploited for increased crop production.

Table 11: Mean number of livestock owned by sampled households by type and district

	Cattle	**Donkeys**	**Goats**	**Sheep**	**Chickens**
Total sample	6 (12.06)	4 (3.40)	12 (11.49)	2 (4.68)	11 (9.08)
Gwanda	8 (15.11)	4 (3.68)	11 (9.99)	2 (5.52)	12 (11.15)
Matobo	5 (7.59)	4 (3.10)	12 (12.85)	2 (3.66)	10 (6.17)

Figures in parenthesis are standard deviations

Access to draft power is very critical for households to achieve food security. The household that owned the largest head of cattle (100) was male headed in Ward 8 of Gwanda district. This household had 13 donkeys and cultivated 8.9 ha of land. This scenario indicates the relationship that exists between access to draft power and level of production.

5.3.3 Sources of household income

Households obtained household income from a diversity of sources. The five major sources of household income are vegetables, livestock, casual labour sales, field crops and remittances (Figure 5). Farmers were also asked to rank the three top most important income sources and livestock emerged on rank number one the most. This illustrates the importance of crop and livestock production in household income generation. Figure 6 confirms the importance of field crops for income generation for those farmers who sold some grain during the three seasons studied. Thirty four percent of the grain sellers depend on crops for their livelihood followed by livestock (23 percent) and vegetable (11 percent) sales.
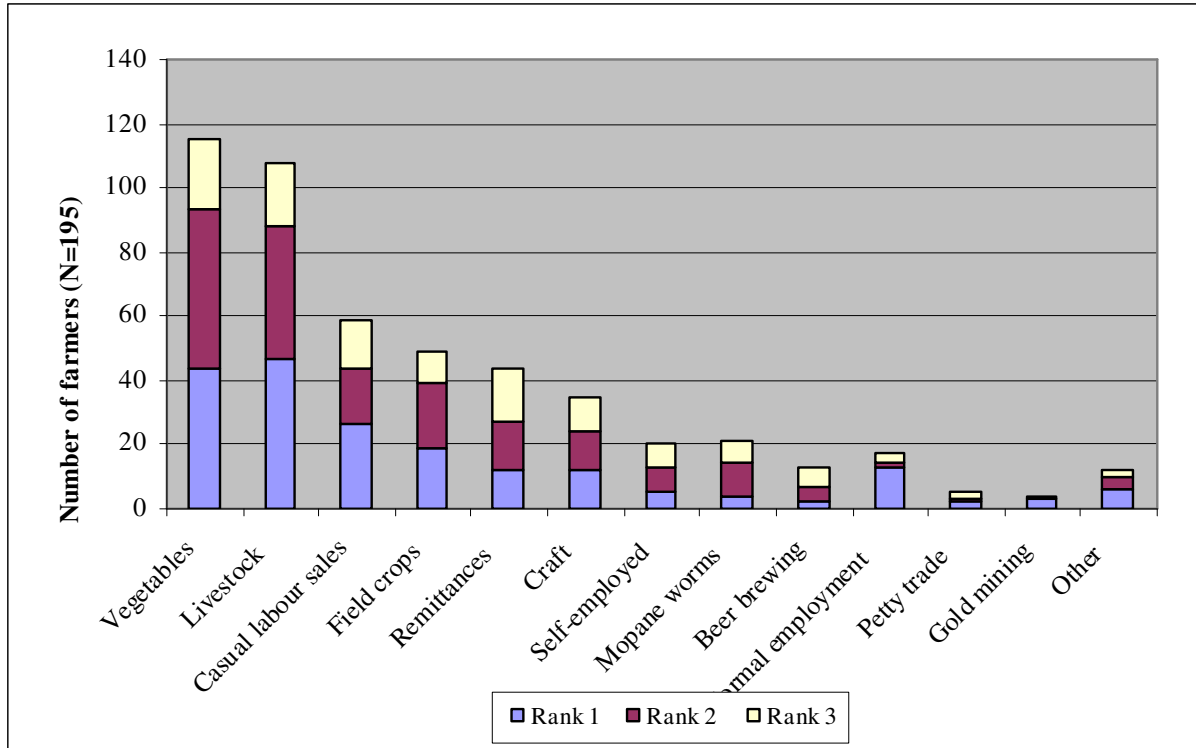
(1) Petty trade = selling fish, *mahewu*, home tailored clothes, thatching grass
(2) Other = pension, butchery business, builder, carpentry, faith healer, orchard, women's money clubs

Figure 5: Ranked sources of income for sampled households
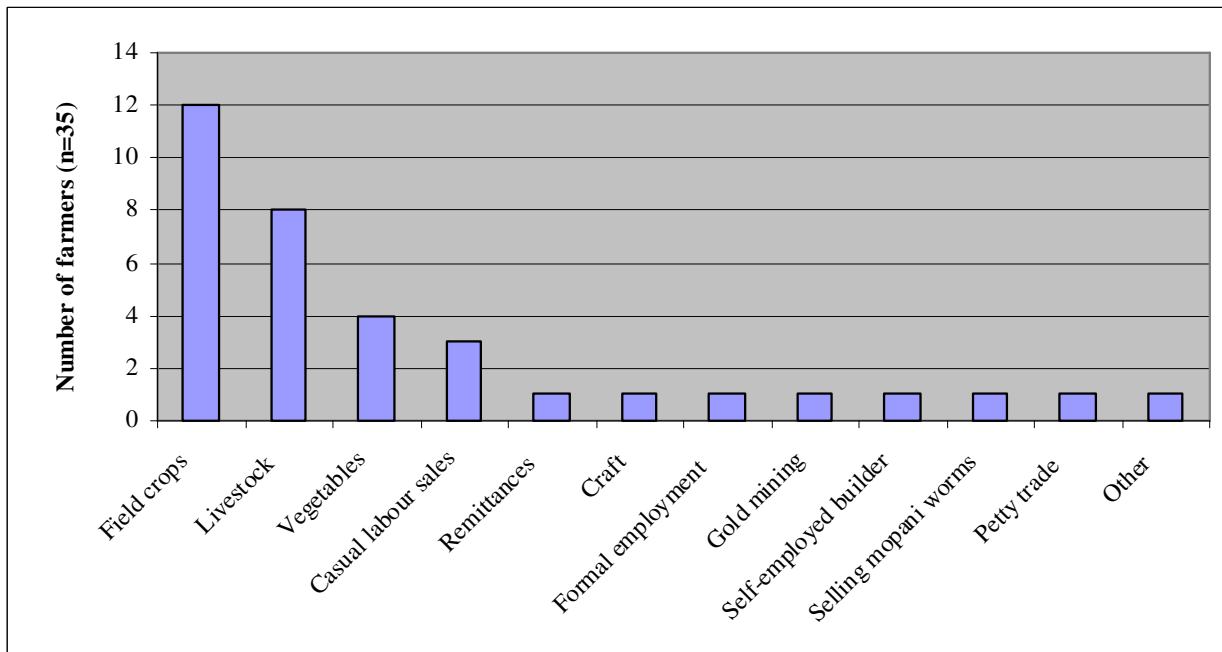
Figure 6: Major income sources for sampled households who sold grain

Figure 7 shows income sources by gender of household head. Male headed households relied more on livestock, casual labour sales, vegetables and field crops for household income, in that order of importance.
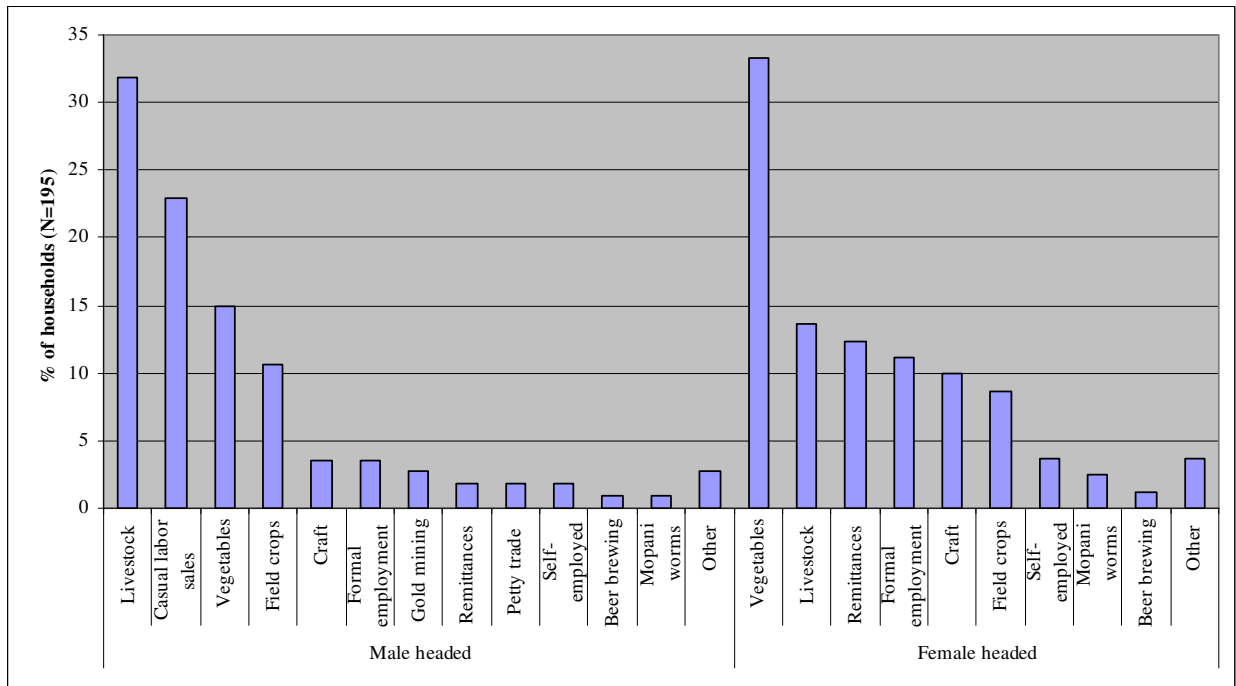
Figure 7: Income sources for sampled households by gender of household head

Female headed households on the other hand are dependent on vegetable sales and livestock is second followed by remittances. Vegetable gardening has always been associated with women. Women also own limited numbers of livestock compared to men. The *de facto* female headed household would receive more remittances from their spouses working away from home.

5.3.4 Membership to farmer groups

Collective action was mainly in the form of membership to farmer groups/institutions that community members voluntarily join and in some instances paid joining and subscription fees. Of the 41 percent households who were members of farmer groups, 41 percent were female headed while 59 percent were male headed households. Three quarters (75 percent) of the interviewed farmers joined farmer groups in the period 2001-2008 while the other 25 percent

joined between year 1980 and 2000. The increase in the number of people joining farmer groups after year 2000 might have been due to increased sensitisation among farmers after they started experiencing crop failure due to droughts and floods. NGOs also intensified their relief activities within rural communities hence the formation of farmer groups.

Most of the farmer group activities were agricultural related (Figure 8). The benefits from these activities included labour pools during periods of peak labour requirements, on-farm trials with NGOs promoting certain crop varieties or cropping technologies, crop production specifically for sale to increase household income, loaning each other draft power, livestock rearing at a central kraal to help poor farmers restock, NGOs distributing seed and teaching farming skills and conservation agriculture. In addition to agricultural activities, farmers provided financial and labour assistance during funerals, and farmer groups acted as savings clubs for future cash requirements.
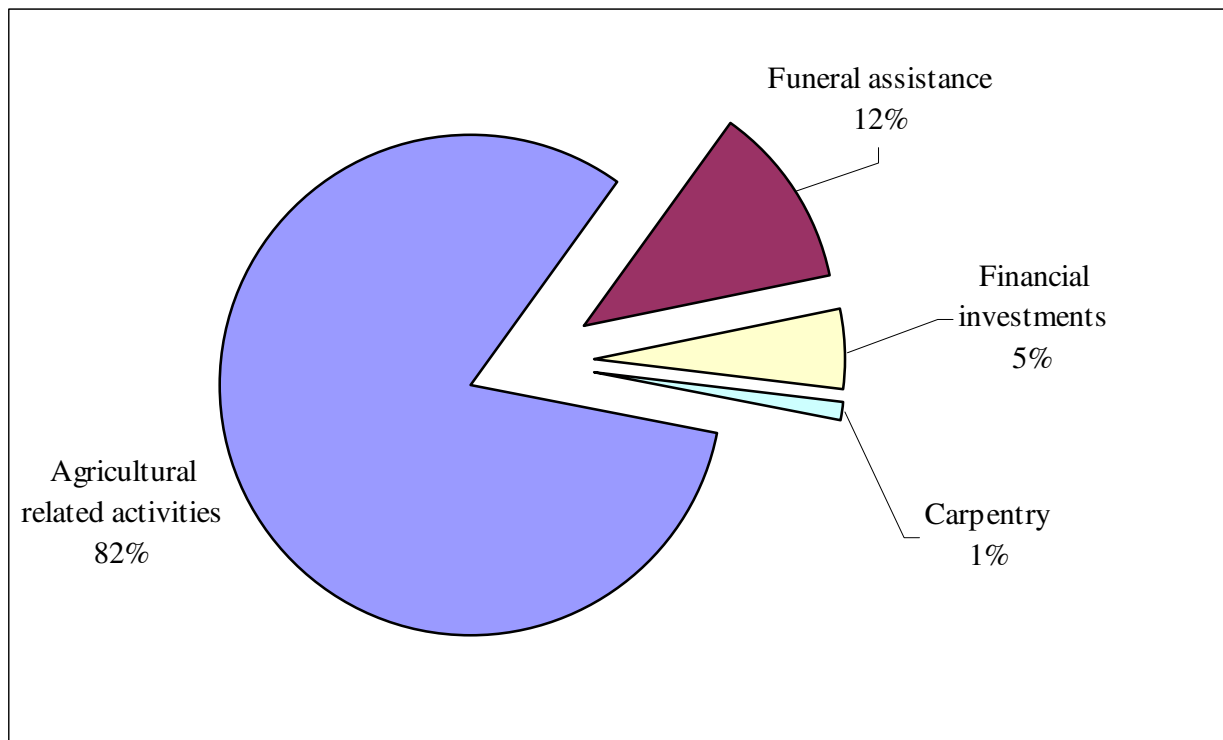
Figure 8: Benefits derived from farmer groups in the sampled districts (n=80)

Those farmers who were not members of any group were asked for reasons why they did not join farmer groups. Table 12 gives the various reasons why. Thirty five percent did not have any

group to join in their area. Some farmers felt too old to join farmer groups while some preferred working individually. Notably is the five percent who were unable to raise the required joining and subscription fees. The reasons given by 59 percent of farmers who did not belong to groups reveal a lack of awareness about the importance of farmer associations. There is therefore need for education about the benefits of collective action.

Table 12: Reasons for sampled households not joining farmer groups

	Households (%) (n=115)
No groups in the area	35
Too old	18
Prefer working alone	14
Farmer too busy	8
Group dissolved	6
Cannot afford joining fees & subscriptions	5
Sickness	3
Groups have enough members already	3
Other[7]	7

Of the 80 farmers that were members of farmer groups, only 21 percent participated in markets. Further descriptive analysis of the quantity of grain sold, area cultivated and production levels for these farmers showed that 65 percent of the households sold between 1 and 20 kg of grain, 18 percent sold between 30 and 50 kg of grain and another 18 percent sold more than 50 kg of grain (Table 13). The mean total area cultivated by group members was 2.4 ha and one farmer cultivated 6.9 ha. The mean total production level was 676 kg with a maximum of 5310 kg of grain produced by one farmer.

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[7] *"Other"* refers to disabled, lazy, resigned, takes care of home, part of a church group already

Table 13: Amount of grain sold by farmer group members in the sampled districts

Amount of grain sold	Households (%) (n=17)
1-10 kg	47
11-20 kg	18
21-30 kg	0
31-40 kg	6
41-50 kg	12
>50 kg	18

5.3.5 Sources of information on prices and marketing of grain

Market information is crucial to enable farmers and traders to make informed decisions about what to grow, when to harvest, to which markets to sell their produce and whether or not to store the grain for future sales. Smallholder farmers also need better access to information about input and output markets (CPWF, 2003).

In this study, households obtained information on marketing and grain prices from various sources that included neighbours, the GMB, other farmers in nearby irrigation schemes, grain traders, the Agricultural Technical and Extension service (AGRITEX), nearby towns and local shops (Figure 9). The importance of neighbours as the most common source of information on marketing and prices demonstrates the significance of farmer-to-farmer knowledge pathways. Other notable sources of information are the GMB, nearby irrigation farmers who produce specifically to sell and grain traders, respectively. Communal farmers used prices from the irrigation scheme farmers and from GMB as their benchmark prices whenever they wanted to sell. The buyer was free to bargain around that standard price.
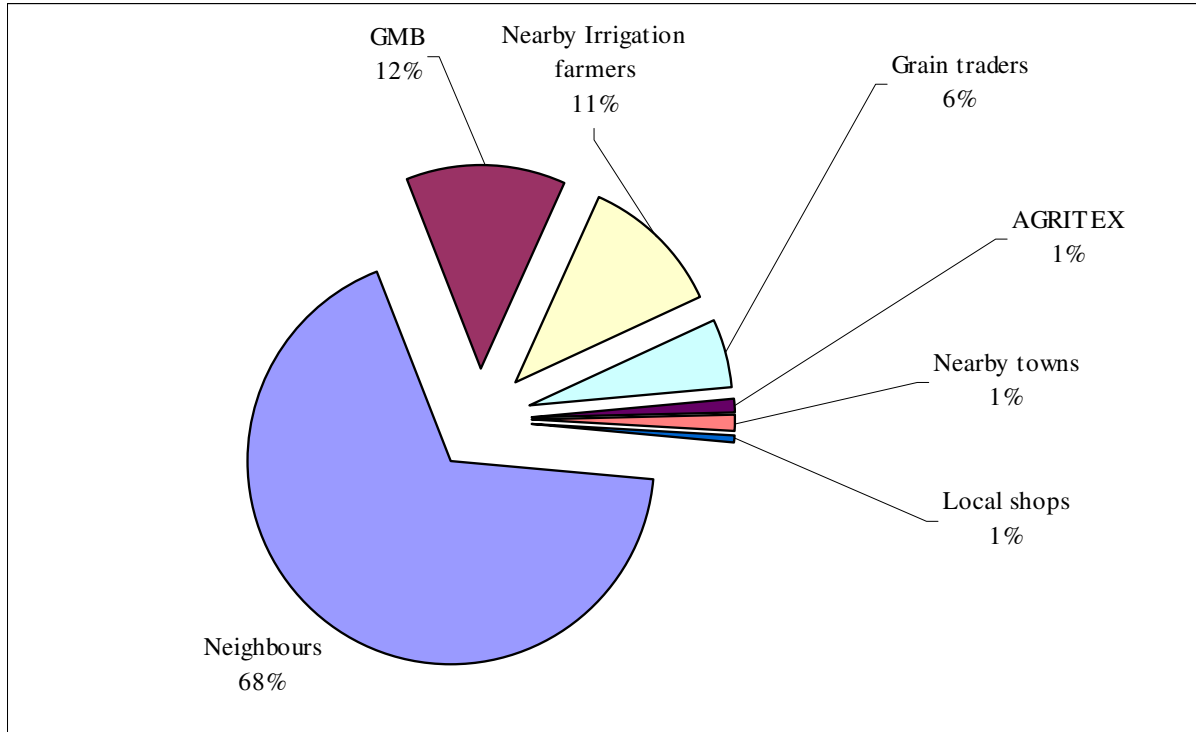
Figure 9: Sampled households' sources of information on prices and marketing (% households) (N=195)

Although neighbours were the overall most common source of information, an analysis of sources of information by gender of household head (Table 14) showed that male headed households received most of their marketing information from other farmers in irrigation schemes and from traders while female headed households got most information from AGRITEX and nearby towns. Neighbours came third for both male and female headed households, as a source of information.

Table 14: Sampled households' sources of information by gender of household head (% households) (N=195)

Source of information	Male headed households	Female headed households
Irrigation farmers	73	27
Grain traders	67	33
Neighbours	57	44
GMB	52	48
AGRITEX	50	50
Nearby towns	50	50

CHAPTER 6

ANALYTICAL TECHNIQUES

6.1 Introduction

This chapter provides a detailed explanation of how the study objectives were addressed by the methods used. The two economic theories that formed the basis of this study; the transaction costs and the collective action theories are reflected in econometric models. To recommend suitable strategies for improving market participation of smallholder farmers, it is necessary to understand the factors that influence market participation. These factors are identified by surveying or measuring all those that could be influencing the situation and then using statistical tests to identify the ones that are significantly related to the assessed indicator of market participation. This chapter presents a description of three analytical techniques that were used to address the different objectives of this study. The chapter also highlights other studies that applied similar approaches. The final section describes the estimation procedure and gives a definition of the variables used in the regression models.

6.2 The multiple regression model

To identify the transaction cost related factors that may affect the quantity of grain sold by sorghum and millet smallholder farmers, a multiple regression model was estimated. Multiple regression analysis is a statistical method that is used with one dependent variable and more than one independent variable. This type of technique allows for prediction of someone's score on one variable on the basis of their scores on several other variables. In multiple regression analysis, more than one variable is used to predict the criterion. Multiple regression analysis is regression analysis conditional upon the fixed values of the regressors and what is obtained is the average or mean value of the regressand or the mean response of the regressand for the given values of the regressors (Gujarati, 2003). A multiple regression allows the simultaneous testing and modelling of multiple independent variables (Palmer, 2009).

The quantity of grain sold is an indicator of the level of household market participation (Von Braun *et al.*, 1991; Goetz, 1992). To determine market participation through use of sales volumes, some analysts compared utility obtained from selling, buying and remaining self-sufficient in a particular commodity and used optimization (Key *et al*., 2000; Holloway & Ehui, 2002; Lapar *et al*., 2002). Households maximize utility by achieving a certain quantity of sales. However, the utility concept can be quite complex when there are several commodities that can be either purchased or sold by households and the fact that levels of utility are unobservable random variables. For analysis, Von Braun *et al*. (1991) made use of ratios for participation. The ratios for subsistence orientation on the income generation and consumption sides of households and the agricultural subsistence ratio were used. The ratio analysis took into account wide concepts like the degree of market integration of rural households into the exchange economy and the total household consumption. Goetz (1992) states that, in principle, variables 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. Although Von Braun *et al.* (1991) used ratios to measure participation; they state that the proportion of agricultural produce that is not used for subsistence is sold. Therefore, the higher the proportion of sales, the greater the market participation.

To test if the multiple regression model is a good fit to the data, it is desirable to have high R-squared and adjusted R-squared values. However, the specification of a model can be determined by theoretical considerations rather than by rigidly following a rule of thumb based on empirical measure of goodness of fit. The alternative is to look at the overall significance of the model using the F-statistic. The value of the F-statistic should be high and its p-value should be 0, indicating a significant F-statistic. A significant F-statistic means that overall the model is significant and that together all the explanatory variables are significant in explaining the dependent variable (Gujarati, 2003).

6.3 The probit model

A probit model was estimated to identify transaction cost related factors that may affect market participation for sorghum and millet smallholder producers in terms of the presence or absence of grain sales during the study period. It was argued above that an important factor affecting

market participation was transaction costs, which are factors beyond transport costs and the market price, and are specific to households and each transaction. This interaction is confirmed by previous studies. Maltsoglou and Tanyeri-Abur (2005) studied the effect of transaction costs on smallholder market integration for potatoes in Peru. Results of the potato study showed that in addition to transport costs and market prices, information, negotiation and monitoring costs affect farmer participation in the market.

The probit model was estimated to determine the transaction cost related factors that influence market participation for sorghum and millet farmers. The type of regression model used depends on the nature of the dependent variable. Since market participation is a qualitative dependent variable, it was necessary to use a qualitative regression model. The objective of the qualitative regression models is to estimate the probability of something happening; hence these types of models are often called probability models. The probit model is a qualitative dependent variable model, also known as the normit model. It is similar to the logit model except that it uses normal distribution. However, the probit model, as opposed to the logit model, is mathematically a bit difficult as it involves integrals. For practical purposes, both logit and probit give similar results (Gujarati, 2003). The choice, therefore, depends on the ease of computation, which is not a serious problem given the sophisticated statistical packages available.

The probit model has been used previously by other researchers. Lapar *et al.* (2003) in their study of policy options promoting market participation among smallholder livestock producers in the Phillipines used a model that combined basic probit and tobit ideas to estimate the variables required in order to effect entry among market non-participants. Goetz (1992) used a probit model to estimate market participation by rural households in Mozambique with a focus on the farmer's choice as to whether or not to participate in crop markets as a seller.

In a qualitative dependent variable model like probit, goodness of fit is measured by using the Likelihood Ratio (LR) statistic and its significance. The LR-statistic should be high with a small p-value of 0 indicating that overall the model is significant and all the explanatory variables have a significant impact on the probability of farmers participating in markets. However, it should be noted that in binary regressand models, goodness of fit is of secondary importance. What matters

are the expected signs of the regression coefficients and their statistical significance (Gujarati, 2003).

6.4 Discriminant function analysis

A discriminant function analysis was employed to determine major factors that discriminate between sorghum and millet sellers and non-sellers. Discriminant function analysis is a statistical technique used to classify the dependent variable between two or more categories. Discriminant function analysis is used to determine which variables discriminate between two or more naturally occurring groups (Burr & Doak, 2007). Discriminant analysis also has a regression technique, which is used for predicting the value of the dependent categorical variable. The technique predicts a value of two categories. When the category of a dependent variable is more than two, it would simply be an extension of the simple discriminant analysis called the multiple discriminant analysis.

Discriminant analysis also has several assumptions, such as multiple linear regressions, linear relationships, homoskedastic relationships, untruncated interval data, etc (Statistics Solutions, 2009; StatSoft, 2008). When data does not meet the assumptions, an alternative technique called logistic regression is used in place of discriminant analysis. For instance, if the predictor variables are a mix of continuous and categorical and/or if they are not normally distributed, the binary logistic regression technique is employed. Bahta and Bauer (2007) used a binary logistic regression model to analyse determinants of market participation within the South African small-scale livestock sector in five selected districts of the Free State Province. The findings of this study were that distance to market, access to market information, livestock births, frequency of extension officer visits and level of farmer training were both logical and statistically significant determinants of farmers' decision to participate in livestock markets. With a categorical dependent variable, discriminant function analysis is usually employed if all the predictors are continuous and normally distributed and logit analysis is usually employed if all of the predictors are categorical. In this study discriminant function analysis was employed because the data meets the assumptions of linear regression and discriminant analysis has more statistical power than logistic regression.

Discriminant analysis was used by Latt and Nieuwoudt (1988) in their study to identify the plot size effect on commercialization of small-scale agriculture in KwaZulu. Their sample was split initially based on plot sizes; small (< 1 ha) and large (> 1 ha) plots. The variables that were important included seed cost/ha, proportion of land under a specific crop, number of implements owned and the presence of a permanent male household head. A further split of the sample was based on whether or not a household sold agricultural produce. This function was intended to discriminate groups according to household income production. Variables that emerged as predictors were: the presence of a permanent male household head, number of migrants, draft power hire/ha, fertilizer costs/ha and land rent costs/ha.

To test whether or not the discriminant model is significant as a whole, the F test (Wilks' lambda) is used. If the F test shows the overall significance of the model, then the individual variables are accessed to see which variable will move the significance from the group mean. Standardised discriminant coefficients are used to compare the relative importance of the independent variables (Statistics Solutions, 2009). Those variables with the largest standardised regression coefficients are the ones that contribute most to the prediction of group membership i.e. the larger the standardised coefficient, the greater is the contribution of the respective variable to the discrimination between groups.

6.5 Data analysis

Data analysis was through use of three different statistical software; E-views, SPSS and Ms-Excel to run frequencies, descriptive statistics, regression models and to perform a discriminant analysis. Determinants of market participation or transaction cost related factors for the existing marketing arrangements were determined, hypothesised, analysed and compared in regression models run in E-views. This process was done for the whole sample and also for categories created based on different household socio-economic characteristics to determine factors that facilitate market participation and quantity of grain sold. A discriminant function analysis was run in SPSS followed by descriptive analysis. MS-excel was principally employed in the development of figures and graphs.

6.6 Estimation procedure

For the purpose of this study, transaction costs were subdivided into three categories, namely information costs, negotiation costs and enforcement costs. The different possible transaction costs, by type, incurred by smallholder small grain farmers (the dependent variables) are listed in Table 15, along with the hypothesized effect on quantity of grain sold and extent of farmer participation in markets. The level of transaction costs in each available grain marketing path determines the extent of smallholder farmer involvement. A detailed description of each of the variables and how each influences farmer participation in markets is provided in the next section of this chapter.

Table 15: Hypothesized determinants for market participation by smallholder farmers

Variable name	Measure	Expected sign of coefficient
Information costs (*ex ante* costs)		
Pricelag	1=Before sale 0=At time of sale	+
Priceagree	1=Yes 0=No	+
Priceknow	1=Similar to expected, Higher than expected 0= Lower than expected	+
Delaypay	1=Yes 0=No	-
Negotiation costs (*costs during transaction*)		
Roadaccess	1=Good access 0=Poor access	+
Pooling	1=Usually/Always 0=Never/Few times	+
Loss	1=Insignificant amount 0=Significant amount	+
Wait	1= More than 2 hours 0= Very quickly	-
Monitoring & Enforcement costs (*ex post* costs)		
Timespay	1=More than once 0=None	-
Pricediff	1= The same or slightly more 0= Less	+
Conflict	1= Yes 0= No	-
Confidence	1=High 0=Low	+
Other variables		
Membership	1=Yes 0=No	+

6.6.1 Description of the variables used in the regression models

6.6.1.1 Ex ante costs--Information costs

Market information is crucial to enable smallholder farmers to make informed decisions about what to grow, when to harvest, to which markets grain should be sent and whether or not to store it. Price information can be costly and difficult to obtain, especially for smallholder farmers. If they get it, it is often incomplete, wrong or outdated. Insufficient market information is common due to large numbers of smallholder farmers, inefficient communication systems and low levels of literacy as well as poor information administration (Fenyes & Groenewald, 1985). The provision of information to smallholder producers is one way of maintaining transparency and inclusiveness. This will make markets to be more accessible (Schubert, 1993). Bailey *et al.* (1999) agree that there is evidence that market information reduces risk.

PRICELAG: The difficulty incurred in obtaining market and price information can be measured by the time lag between market prices becoming known and the time of sale. The time difference in discovering price information in the markets is important for a farmer to make a decision to sell, whether price information is obtained at the time of sale or a couple of days before the time of sale. In this context smallholder farmers were asked with what time difference they discovered price information in the markets. PRICELAG takes on the value of 0 if price information is obtained at the time of sale and 1 when it is received a number of days before the time of sale.

PRICEAGREE: Previously agreed sales will assist the farmers in lowering the information requirement costs of a transaction. When sales are agreed previously there is no need to find a buyer for the produce and to gather price and market information. A relevant variable to differentiate between sales agreed previously to the time of sale and sales agreed at the time of sale was used. PRICEAGREE takes a value of 1 if sales were agreed upon previously and 0 when sales were agreed at time of sale.

PRICEKNOW: Incorrect price information is also a cost to the farmer. If the price information is not correct, the rural farmers could mistakenly select a market or transaction and be selling their

produce at a lower price, thereby losing some of the possible profit. Consequently, the farmers were asked if the actual sale price is different from the known sale price. PRICEKNOW takes a value of 1 if the sale price was similar to expected or higher than expected and 0 when the sale price is lower than expected.

DELAYPAY: If buyers delay payment for sold grain, farmers will not be sure that subsequent transactions will be successful. Farmers were asked if payment for their sold grain was delayed or came on time. DELAYPAY takes a value of 1 if payment for sold grain was delayed and 0 if payment was instant at time of sale.

6.6.1.2 Costs incurred during the transaction --Negotiation costs

ROADACCESS: The majority of smallholder farmers live in areas with poor roads which render transport services not only unavailable, but also highly priced. Transportation costs are incurred by the households when transporting the produce to the market and are considered to be negotiation costs when they are specific to the marketing channel chosen. Road access is highly correlated with transport costs and therefore was used as a proxy for transport costs. With good road access, farmers tend to participate more in markets. ROADACCESS takes on the value of 1 for good road access and 0 for poor road access.

POOLING: Farmers can coordinate with one another to pool transportation to reach the market. Pooled transportation assists the farmers to reduce negotiation costs during transaction time. POOLING takes on the value of 1 if transport was pooled and 0 if farmers transported individually.

LOSS: Grain being taken to market can be severely lost through transportation. Loss of the grain could cause problems for the farmers to the extent that if the grain is seriously lost the farmer may no longer be able to sell it once the market is reached. LOSS takes on the value of 1 if insignificant amounts of grain were lost and 0 if the farmer lost significant amounts of grain.

WAIT: Time spent at the market waiting to sell the produce is another negotiation cost, given that time spent at the market could be exploited for other activities. The time the farmer had to spend in the market could vary from one hour to the whole day. WAIT takes on the value of 1 if the farmer had to wait for more than 2 hours to sell and 0 if sales took place quickly.

6.6.1.3 Ex post costs --Monitoring and Enforcement costs

TIMESPAY: A monitoring cost is incurred when the farmer has to spend time going to the buyer to obtain the payment for the produce. The number of times that the farmer has to approach the buyer to get paid can vary and as it increases the costs incurred to set time aside to go to the buyer to obtain the payment increase. TIMESPAY takes on the value of 1 if the farmer approached the buyer more than once to get paid and 0 if the buyer did not have to approach the buyer for payment.

PRICEDIFF: The loss incurred when the final sale price obtained for grain sale is less than the sale price agreed is a monitoring cost. The final sale price could be less, the same or slightly more than the initially agreed price. PRICEDIFF takes on the value of 1 if the final sale price is the same or slightly higher than the agreed price and 0 if the final sale price is less than the initially agreed price.

CONFLICT: If buyers generate conflict over produce quality, the farmers will not be sure that the transaction will be finalised. In this case all previous information and negotiation costs will have been misspent, a new buyer might need to be found and time will have been lost with the wrong buyer. Farmers were asked if the buyers recognised quality of grain and CONFLICT takes on the value of 1 if there were conflicts on grain quality recognition and 0 if there were no conflicts.

CONFIDENCE: Confidence and trust in the buyer assists the farmer in carrying out a smooth transaction and could reduce transaction costs. Trust in the buyer also lowers other transaction costs as the farmer will not need to obtain information as to whether the buyer is recognized as

reliable. CONFIDENCE takes on the value of 1 if the farmer has high confidence on the buyer and 0 if the confidence on the buyer is low.

6.6.1.4 Other variables

MEMBERSHIP: Membership in a farmer group or institution was taken as a household characteristic that facilitates market participation and lowers transaction costs. Farmers who are members of farmer groups/institutions tend to participate more in markets and sell more grain. MEMBERSHIP takes on the value 1 if a farmer belonged to at least one farmer group/institution and 0 if the farmer was not a member of any group.

6.6.2 The regression models

6.6.2.1 The multiple regression model

A multiple regression model was run to estimate the effect of transaction cost related factors on the quantity of grain sold. The quantity of grain sold indicates the level of market participation for a household (Von Braun *et al.*, 1991; Goetz, 1992). The identified factors therefore would be an indication of the transaction cost related factors that influence farmer participation in markets.

$$Q = \beta_0 + \beta_1 ROADACCESS + \beta_2 PRICEKNOW + \beta_3 PRICEDIFF + \beta_4 WAIT + \beta_5 CONFIDENCE + \beta_6 PRICEAGREE + \beta_7 DELAYPAY + \beta_8 CONFLICT + \beta_9 MEMBERSHIP$$

Q	= quantity of grain sold in kilograms
ROADACCESS	= state of the road to the market
PRICEKNOW	=difference in price knowledge
PRICEDIFF	=difference between sale and agreed price
WAIT	= time lag to sell
CONFIDENCE	=confidence and trust in the buyer
PRICEAGREE	= time of price agreement
DELAYPAY	= delayed payment for sold grain
CONFLICT	=conflicts because buyer did not recognise grain quality
MEMBERSHIP	= membership to farmer groups/institutions

6.6.2.2 The probit model

Since market participation is a qualitative dependent variable, it was necessary to use a qualitative regression model to test the hypothesis that membership in a farmer group or institution and other relevant factors facilitate market participation. A score of 0 to 1 was used as the dependent variable for estimating farmer participation in markets. The qualitative variable is defined as 1 if sales took place and 0 if there were no sales at all. The presence of sales during the period 2004/05 to 2006/07 was used as a proxy for market participation.

$$Participation = \beta_0 + \beta_1\,PRICEKNOW + \beta_2\,PRICELAG + \beta_3\,POOLING + \beta_4\,CONFIDENCE + \beta_5\,TIMESPAY + \beta_6\,DELAPAY + \beta_7\,LOSS + \beta_8\,MEMBERSHIP$$

PRICEKNOW	= difference in price knowledge
PRICELAG	= time of discovering price information
POOLING	= pooled transportation to the market
CONFIDENCE	= confidence and trust in the buyer
TIMESPAY	= times approached buyer for payment
DELAPAY	= delayed payment for sold grain
LOSS	= grain loss through transportation
MEMBERSHIP	= membership to farmer groups/institutions

6.6.3 The discriminant function

A discriminant function is a linear combination of the discriminating (independent) variables. The functional form is denoted in equation (1) below.

$$L = b1X_1 + b2X_2 + ... + bnX_n + C \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \textbf{(1)}$$

L= discriminant function
b1= discriminant coefficients
X= independent variables
C = constant

In discriminant analysis, the value of two categories is predicted. For the two groups, there is one discriminant analysis function. When the category of a dependent variable is more than two, it simply becomes an extension of the simple discriminant analysis called the multiple discriminant

analysis. For multivariate discriminant analysis there will be g-1 discriminant functions (Statistics Solutions, 2009).

For this study, one discriminant function analysis was used to identify differences between households that sold grain and those that did not sell any grain. The total sample was split up according to whether or not a household sold sorghum and/or millet during the period 2004/05 to 2006/07. A two-group discriminant function with the two groups coded as 1 and 2 for sellers and non-sellers, respectively, was run in SPSS with the iterative stepwise variable selection method to determine which variable(s) are the best predictors of farmers' subsequent choice about marketing. The fourteen potential discriminating variables that were included were: the district in which the household is located, age of household head, the highest educational level attained by household head, gender of household head, total number of permanent household members, total number of cattle owned by the household, total number of donkeys owned, total number of goats owned, total number of sheep owned, membership to a farmer group/institution, main source of household income, total area cultivated during the studied period, total production level and method of transporting grain to the market.

To determine the nature of the discrimination, a descriptive analysis was done using the significant individual predictors of group membership.

CHAPTER 7

RESULTS OF THE STUDY

7.1 Introduction

This chapter presents and discusses the study findings from both the reconnaissance and formal surveys. The results are discussed as they are presented. The initial part of the chapter presents a review of the various marketing arrangements, particularly contracts, for different types of commodity crops. The way in which small grains were marketed in the study areas is compared across the two districts and across other socio-economic strata like education level attained by household head, age of household head and gender of household head. Lastly, results of econometric models on specific determinants of farmer market participation are summarized as well as results of a discriminant analysis.

7.2 Crops contracted by different contracting companies

Table 16 shows the various commodities and the respective contracting companies. Different companies, contract specific commodities over time, for example, cotton production has been grown under contract for a long time in Zimbabwe and its major contractors have been COTTCO and Cargill.

Table 16: Crops contracted by different companies in Zimbabwe in 2008

Company	Produce
Honeywood	Tomatoes, Onions, Carrots, Green pepper, Cabbage, Peaches
Agricultural Seeds and Services	Cowpeas, Sorghum, Sunhemp
COTTCO	Cotton
Cargill	Cotton
Chibuku breweries	Red sorghum
Ingwebu breweries	Red sorghum, Maize
Natbrew	Barley
GMB	All crops except horticultural
Pannar seed	Red sorghum, White sorghum, Maize
Staywel Trading	Soyabean

7.3 Who is contracting and the types of contracts

The types of contracts offered to either groups of farmers or to individuals, the services offered by contractors and other contract conditions are shown on Table 17. Since one of the major challenges farmers face is how to ensure produce reaches the market, it is evident that the majority of contractors offered free transport for farmers who met the contract conditions.

Given all these existing contracts on the different crop types and also on sorghum; sorghum production should have been increasing. The decline in sorghum production has been primarily due to recurrent droughts in recent years and some contractors pulling out stating problems of side marketing and grain contaminated with sand and stones. For example in Chiredzi district, Chibuku breweries, Seed Co, Development Technology Centre (DTC), National Foods, the GMB and private traders were buying sorghum until year 2000 when DTC, Seed Co and National Foods pulled out. Through these buying companies, sorghum reached many destinations, the furthest being Botswana through DTC and private traders.

The brewing industry is the major contractor of sorghum. Breweries used maize as an adjunct until recently when maize production started declining after year 2000. Due to competition for maize use in the milling industry for food security purposes, they had to change their beer formulations to include more sorghum. Sorghum and millet millers also cited a substantial opportunity that clearly exists for the production and sale of sorghum and millet meal. However, it was difficult to estimate the ultimate size of this market without additional information on consumer preferences. Millers and some farmers, however, suggested that most consumers have a taste preference for maize, rice, and wheat products. Sorghum or millet meal would survive simply as a specialty product.

Table 17: Characteristics of the major companies and contracts offered for field crops in Zimbabwe in 2008

Nature of industry	Company	Level and nature of contract	Services provided	Prices and payment	Transport
Parastatal	Grain Marketing Board (GMB)	Individual/Signed	Seed sold on loan at stated price Field visits done	Maize price gazetted by government each year. Prices for small grains determined by GMB each year after harvest. Payment by cheque to individuals	Company provides free transport
Brewery	Delta beverages /Chibuku breweries	Group/ Signed	Variety for planting specified and given to farmers on loan Field days sometimes held Field visits done	Price announced at time of sale. Payment mostly by cheque to group. Cash transfer into bank accounts started in 2006	Provided free for 30 tonne consignments
	Ingwebu breweries	Individual/Signed Group/ Signed	Seed, packaging material, weighing scales supplied	Price negotiated based on gazetted maize price at time of sale. Payment by cheque to individuals and groups	Company provides free transport
eed production	Agricultural Seeds and Services	Individual/Signed	Seed supplied and cost deducted upon delivery of produce Extension provided in conjunction with AGRITEX workers	Price given in contract	Produce collected from village by company at its own expense
	Pannar seed	Individual/Signed Annual contracts	Seed provided on loan Crop management services offered until harvest time	Price given in contract. Payment by cheque	Company provides free transport
Oilseed processing	Olivine	Individual/ Contractor/Signed	Seed sold Extension provided in the form of literature Visits done when possible	Price given in contract	Not provided for in contract but when requested, company can provide freely.
Finance	Banks	Individual/Signed	Loan to purchase inputs Inputs paid for based on suppliers' vouchers Field visits conducted	Farmer free to sell to any buyer Loan Repaid with interest	Not provided for in contract All sales depend on agreement between farmer and buyer
Commodity broker	Staywel Trading	Individual/Signed	Seed supplied and cost deducted upon delivery of produce Extension provided in conjunction with AGRITEX workers	Based on quality. Price not necessarily given in contract. Payment by cheque	Company provides transport, cost met by the farmer
Cotton production and trade	COTTCO	Group. Contract is part of group's constitution. Signed.	Seed bought through cash or provided on loan. Chemicals and fertilizers also provided on loan. Extension provided by Agritex and input companies.	Based on grade. Price not necessarily given in contract. Basic payment made initially then the rest after two weeks. Payment by cheque.	Farmers deliver to depot

Source: Mudhara & Kwaramba (2002); Author's Field Research (2008)

It would have been interesting to show the pattern of sorghum and millet utilization in Zimbabwe for the past ten years for the sampled industries, particularly the breweries, millers and stock feed producers. However, such permission was not granted by the respective firms as they regard their information with high confidentiality.

Success stories of sorghum and millet marketing exist among farmers with and without contracts. Text box 1 and 2 present interviews of two successful communal farmers from two different resettlement areas in Chiredzi district. Their separate experiences indicate great potential of enhancing marketing of sorghum and millet with/without contracts in the rural communities.

Textbox 1: Female farmer in Village 3 Fair Range A1 resettlement area.	**Textbox 2:** Male farmer in Village 8 Old resettlement
Production: Red sorghum, groundnuts, bambaranuts, cotton as her main crops. She has always grown 6 ha of sorghum every year. 10 cattle and 5 donkeys are her source of draft power. She uses retained seed and in 2007 she received seed from GMB as part of operation Maguta. She was selected for the GMB program because she is one of the best sorghum producers in the area.	Production: Grows 40 ha of Maize and 35 ha of red sorghum. Does not grow white sorghum and millet because of problem of quelea birds. Red sorghum is grown under Chibuku breweries contract since 2000. In 2007/08 produced for GMB under operation Maguta GMB contracts. He relies on his 60 cattle and a tractor for draft power.
Marketing: She sells sorghum to a private trader who buys from the area for resell in towns. In 2005/06 season, she sold 15 x 50kg bags of sorghum. 2006/07 was a drought year; she could not sell any grain. Buyer buys from home and he determines the price. Was not on contract 2007/08 when she was selected for GMB's operation Maguta. GMB gives farmers seed and provide transport for the produce.	Marketing: Started selling to GMB in 2006/07 when he sold 7 tonnes. Sells 30 tonnes to Chibuku breweries every year, he is able to fill up a 30 tonne truck from his own field. He split from the Chibuku sorghum production farmer group in 2005 because he was bearing most of the transport costs since the other farmers in the group could not produce as much. Chibuku breweries announces its prices at time of sale. GMB uses government gazetted prices. The buyer determines the price. Chibuku provides seed but does not take all the harvested grain from the farmer, living the farmer with some grain for food. His main sources of income are sorghum and livestock sales, tractor hire (rates dependent on prevailing diesel prices) and traditional beer sales.
Major challenges faced: lack of information/knowledge about other sorghum markets, low prices offered by the private trader, sorghum seed unavailability in shops, no farmer groups in the resettlement area.	Major challenges faced: high transport costs, GMB takes long to collect grain and also to pay farmers, Chibuku also delays grain collection, too low prices offered by buyers, fuel unavailability to carry grain home from the fields, seed from Chibuku comes late, labor for weeding usually scarce when people receive NGO food handouts.
Suggestions to improve production & marketing: Improve access to improved seed varieties through making seed available in local shops, formation of farmer groups in the area.	Suggestions to improve production & marketing: Sorghum prices should be improved, probably higher than maize price because of the labour involved (traders & other villagers offer better prices).

7.4 Sorghum and millet marketing by sample households

The major buyers of small grains for the studied households were neighbours. About 30 percent of the interviewed farmers sold small grains. Twenty seven percent of the farmers in Gwanda district sold sorghum while only 14 percent sold sorghum in Matobo district. Eleven percent and nine percent of the household sold millet grain in Gwanda and Matobo districts, respectively. Some farmers (32 percent) exchanged/barter traded their grain for other commodities like maize grain, groundnuts, small stock, school uniforms, as payment for labour, etc. It would have been interesting to get the proportion of farmers who are net grain sellers if data was permitting. However, average total production figures reveal households in both districts are not able to produce grain enough to last them till the next season, as also shown by the Cereal balance sheet (Table 19), hence only a few farmers sold grain for 2004/05 to 2006/07 seasons.

There was no significant difference between amount of grain sold by farmer group members and non-members for 2004/05 to 2006/07 seasons. Although there were no significant differences in the proportion of grain sellers by education level attained, Table 18 shows that the likelihood of a farmer to sell grain increased with level of education of household head and farmers with at least secondary education sold the most. This confirms findings from other studies that find a strong participatory impact from education (e.g. Holloway *et al.*, 2000a).

Table 18: Marketing by sampled households with different education levels (% households)

Education level	Sorghum sellers	Millet sellers
Illiterate	19	10
Primary education	17	8
Secondary education	25	12
Tertiary	25	0

7.5 Sorghum and millet marketable surplus

Table 19 shows the Cereal balance sheet for Gwanda and Matobo districts for the season 2007/08. To determine the levels of marketable surplus among sorghum and millet smallholder producers, a Cereal balance sheet was drawn up. The food security status of the households was

computed by subtracting the household's cereal requirement from the total cereal production and adding cereals donated to households by relief non-governmental organisations. A Cereal balance sheet was developed to estimate whether the average cereal production satisfies the family daily requirements. Already survey findings have shown that production levels are too low (Table 8), the families are relatively big and alternative household income sources are scarce (Figure 5). Since household priorities are such that they meet family requirements first, this has implications on the marketing of the cereal grains. Households will often sell surplus grain that remains after meeting family food requirements.

The Cereal balance sheet was also based on the following assumptions and justification as recommended by the Food Agriculture Organization of the United Nations (FAO/WFP, 2008).

- **Population:** As described in Table 5, mean household size was 6.5 for Gwanda district and 7.1 for Matobo.

- **Stocks:** Given the low production levels for the three seasons studied and also given the low purchasing power of rural farmers, no stock build-up is assumed for all cereals.

- **Cereal consumption:** Per capita cereal consumption of 158 kg per annum, distributed across different cereals as maize 120 kg, millet 13 kg, sorghum 13 kg and 12 kg wheat is used. At 158 kg of cereals per capita per annum, about 69% of the minimum calorie needs of a person (at 2 100 kcal/day) would be met. The remainder is expected to come from other non-cereal foods such as legumes, meat, wild fruits, etc.

- **Feed use:** Use of cereals for animal feed is limited in the rural areas given the large shortages of grains.

- **Seed use:** Hybrid maize seed purchased from seed suppliers and the GMB are used almost universally in Zimbabwe. However, when this seed is not available on time many farmers resort to using retained seed. In the balance sheet, seed requirements were calculated by using the recommended seed rates and forecast area to be planted the following year. The average sizes of crop plots were 1.4 ha for maize, 1.2 ha for sorghum and 1.0 ha for millet. Some 20 percent is added to account for potential re-plantings.

- **Post harvest losses**: They are assumed at five percent of production for all grains. It is recognized that the losses at individual farm level vary a great deal depending on the

storage. There is a need for a technical study to determine the exact extent of losses under various conditions.

- **Commodity cross substitution:** Farmers usually exchange small grains for maize. Research has shown that white maize is the principal staple, with sorghum and millet being important drought resistant crops to fall back to as last resort.

The domestic balance is negative for the three major food crops, maize, sorghum and millet. It is clear from this Cereal balance sheet that current production levels fall far below the family daily food requirements. The food security situation has, however, remained relatively stable despite the low production levels due to the contribution of food aid programs. Households in rural areas received monthly cereal ration sizes of 10 kg per person per month plus vegetable oil rations (FAO/WFP, 2008).

Table 19: Cereal balance sheet (kg) for the sampled households (2007/08)

	Maize	**Sorghum**	**Millet**
Opening stock	0	0	0
Total production	209	124	101
Gross domestic requirements	1791	213	213
Food use	1632	177	177
Feed use	0	0	0
Seed use	23	36	36
Losses	10	6	5
Commodity cross substitution	0	17	17
Domestic shortfall/surplus	-1582	-89	-112
Food aid	136	0	0
Uncovered household deficit	-1446	-89	-112

Source: FAO/WFP (2008); Author's Field Research (2008)

This therefore explains the poor participation in markets. With this type of households that are both producers and consumers and with rare alternative income sources, for farmers to be able to sell grain, productivity should be increased to first ensure adequate annual food supply for the household. Participation in the market and the amount of grain sold would then depend on the net position of the household. Only the proportion of produce that is not used for subsistence is sold.

7.6 Transaction cost related factors and quantity of grain sold

Results of the multiple regression model on the effect of transaction cost related factors on quantity sold are presented in Table 20. The results of this model show that previously agreed prices (PRICEAGREE) are significant at five percent level in influencing the quantity of grain sold. Road access (ROADACCESS), confidence and trust in the buyer (CONFIDENCE), and membership in a farmer group (MEMBERSHIP) are not significant in influencing the quantity of grain that a farmer sold. Although these three explanatory variables are not significant and the R-squared value is low (12 percent), the F-statistic of 6.5 is significant with a p-value of 0. The p-value of the F-statistic indicates that overall the multiple regression model is significant and together all the explanatory variables have a significant impact on the quantity of grain sold.

Table 20: Multiple regression model estimates of the determinants of quantity of grain sold by sampled households

Variable	Coefficient estimate	Standard error	t-Statistic	p- value[8]
CONSTANT	-0.052133	1.732767	-0.030087	0.9760
ROADACCESS	2.142834	3.247303	0.659881	0.5101
CONFIDENCE	2.542958	3.668032	0.693276	0.4890
PRICEAGREE***	9.696925	3.573678	2.713430	0.0073
MEMBERSHIP	1.190973	2.307968	0.516027	0.6064
R-squared = 0.120890 Adjusted R-squared = 0.102382 F-statistic = 6.531890 Probability (F-statistic) = 0.000060 Number of observations = 195 ***Significant at 1% level ** Significant at 5% level * Significant at 10% level				

Lack of significance of the three explanatory variables may be attributed to the very small sales which led to very low variability between households. This agrees with the low production levels and justifies literature that communal farmers' primary objective is to meet their family food

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[8] p-value is the probability value. It is defined as the lowest significance level at which a null hypothesis can be rejected. Also known as the observed or exact level of significance.

requirements and only sell surplus, if any. These subsistence families will only sell to a neighbour who might have failed to produce enough for that season. Some households will only sell out of distress to cover other pressing cash needs like school fees.

However, as the analysis proceeded, some variables like PRICEKNOW, PRICEDIFF, DELAYPAY, WAIT and CONFLICT were excluded from the multiple regression model because they were causing a near singular matrix in E-Views and with their inclusion, the model could not run.

7.7 Transaction cost related factors and market participation

Results from the probit model (Table 21) show that pooled transportation to the market (POOLING), loss of grain through transportation (LOSS) and membership to farmer groups (MEMBERSHIP) [9] did not influence the probability of farmer participation in markets. Three explanatory variables were significant in influencing the probability of farmer participation in markets. Confidence and trust in the buyer (CONFIDENCE) is significant in influencing the probability of farmers participating in markets at one percent level of significance while the difference in price knowledge (PRICEKNOW) and delayed payment for sold grain (DELAYPAY) are significant at five percent level of significance. The LR statistic is 59.27 with a very small p-value of 0 indicating that together all the explanatory variables have a significant impact on the probability of farmers participating in markets. To note is that as analysis proceeded, PRICELAG and TIMESPAY were eliminated from the equation due to multicollinearity problems.

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[9] Membership in a farmer group was not significant in influencing quantity of grain sold and the probability of farmers participating in markets, and this finding is in marked contrast to other studies. This indicates that the existing farmer groups were not formed with a commercial orientation but for social activities instead.

Table 21: Probit model estimates of determinants of market participation for sampled households

Variable	Coefficient estimate	Standard error	z-statistic	p-value
CONSTANT	-2.140056	0.286356	-7.473413	0.0000
PRICEKNOW**	0.555136	0.287804	1.928869	0.0537
POOLING	5.672284	2397134	2.37E-06	1.0000
CONFIDENCE***	1.290772	0.300134	4.300654	0.0000
DELAYPAY**	-1.149797	0.540285	-2.128132	0.0333
LOSS	6.715421	1615760	4.16E-06	1.0000
MEMBERSHIP	0.281611	0.266476	1.056796	0.2906
LR statistic = 59.26928 Probability (LR statistic) = 2.11E-10 Number of observations = 195 ***Significant at 1% level ** Significant at 5% level * Significant at 10% level				

7.8 Factors discriminating sorghum and millet sellers and non-sellers

Results of the discriminant function analysis to determine discriminating variables between the two groups for small grain sellers and non-sellers are shown on Table 22. Six variables were found to explain group differences with statistical significance at one percent level. The number of donkeys that a household owned had the largest standardised regression coefficient indicating that it contributed the most to the prediction of group membership.

Table 22: Coefficients of predictors to group membership in the sampled districts

Variable	Coefficient
Number of donkeys owned	0.519
Crop production levels	0.499
Source of household income	-0.418
Transport to market	0.381
District	-0.310
Area cultivated	0.298

The second most important predictor was the household's level of crop production followed by source of household income, the method of transporting grain to the market, the district in which the household is located and the total area that the household cultivated. These results appear similar to those of previous studies using alternative methods. The results of this analysis support the second hypothesis of this study which stated that specific wealth-ranking factors distinguish grain market participants from non-participants.

A **descriptive analysis** of the distinguishing variables individually shows that;

- Sellers own an average of seven donkeys while non-sellers have an average of three donkeys. Seven donkeys are enough for at least one span of draft power.

- Sellers produced a mean of 1109 kg of sorghum and millet grain while non-sellers produced 580 kg from 2004/05 to 2006/07 seasons. This is linked to availability of adequate draft power for grain sellers. The positive association between ownership of donkeys, and sorghum and millet production level is clear. This pattern appears repeatedly in the few studies that study determinants of production for smallholder farmers (Binswanger & Rosenzweig, 1986; Lapar *et al.*, 2003).

- Among grain sellers, 31 percent obtain their household income from livestock, 26 percent from field crops and 23 percent from vegetables while non-sellers obtain household income from the same sources in the following proportions 18 percent from livestock, seven percent field crops and 26 percent vegetables.

- Three percent of the grain sellers pooled transport to the market while 97 percent transported individually.

- 66 percent of the grain sellers are in Gwanda district and 53 percent of the non-sellers are in Matobo district. The major differences between the two districts are described in Annexure 3, Table B.

- Sellers cultivated an average of 3.04 ha while non-sellers cultivated an average of 2.23 ha. This could be due to better access to draft power for grain sellers.

Other variables expected to discriminate between the two groups according to theory and previous studies are ownership of cattle, agro-ecological zone, presence of a permanent male household head, age of the household head, literacy level of the household head, membership to a

farmer group/institution, access to a market and confidence and trust in the buyer (Latt & Nieuwoudt, 1988; Green *et al.*, 2006; Barrett, 2008).

7.9 Strategies for promoting participation of smallholder sorghum and millet farmers in markets

To determine strategies for enhancing participation of smallholder farmers in the marketing of small grains, farmers were asked to give suggestions on what they thought should be done to improve sorghum and millet production and marketing. The results of the analysis are shown in Figure 10 and in Annexure 3, Table C. These results are an indication of issues that should be focused on when addressing apparent constraints that are currently inhibiting the ability of smallholder sorghum and millet farmers to participate in markets.
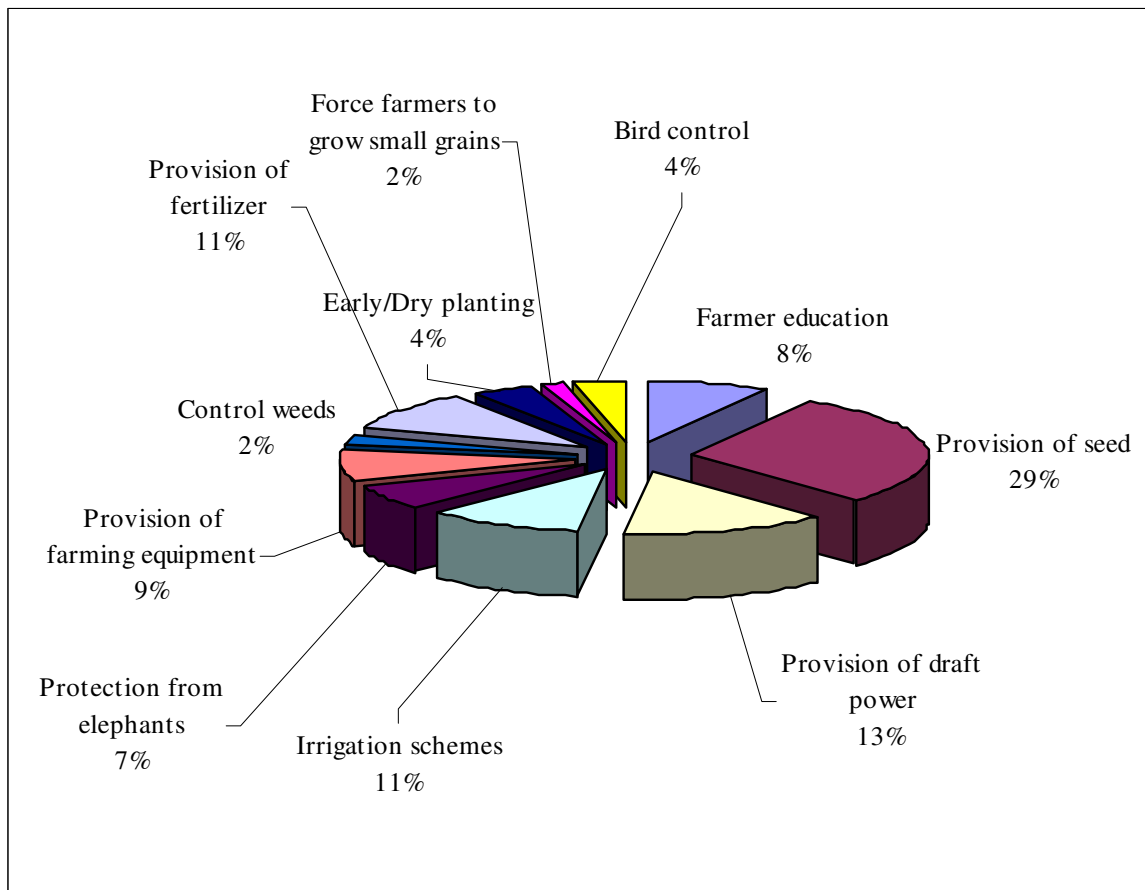
Figure 10: Farmers' suggestions for improving sorghum and millet production in Zimbabwe (n=341)

The major issues identified by farmers, in order of importance are; seed unavailability, lack of access to draft power, lack of access to fertilizer and establishment of irrigation schemes. To directly improve marketing of sorghum and millet, farmers suggested provision of transport to the market, production of marketable surplus and establishing a local market.

Results of this analysis indicate a general tendency for smallholder farmers to point to exogenous household constraints on market participation rather than identifying endogenous household factors like age, education, gender of household head, household size, etc. A clear deduction from the farmers' suggestions is the need for external assistance for farmers to increase their existing resources for higher productivity. Literature has shown that one possible way of securing external assistance is through contractual arrangements. Contractual arrangements are seen as one form of vertical coordination in which the private sector can engage. Contract farming is one way of making sure that the identified market participation determinants are focused on when addressing limitations that are currently hindering farmer market participation. Through contracting, smallholder farmers can be linked to technologies that they need on one side of the chain and to product markets for the commodity on the other side.

Smallholder farmers, especially because they are resource poor will require some sort of partnership that makes possible the access to markets and inputs. Given the remoteness and inaccessibility of most communal areas, and the limited ability of government to remedy the situation, the degree to which smallholder farmers will participate in markets will depend on their ability to mobilize their resources. Therefore, some partnership with the private sector is not only desirable but necessary. Part of the smallholder farmers' problem is that their grain volumes are small and they are dealing with powerful and equipped partners whom they cannot restrain. The challenge therefore is to provide that capacity to smallholder farmers and enable them to do business with the private sector on an equal basis. That means getting the different individual farmers organized into groups/associations, which protect collective interests. Experience from elsewhere and for other commodity crops has shown that farmer associations work well in ensuring reduced transaction costs involved in dealing with smallholder farmers through contractual arrangements (Cheater & Jackson, 1994; Obare *et al.*, 2006).

Contract farming has now been recognized as a strategy and planning priority. Figure 11 shows diagrammatically a hypothetical contract farming framework. It sets out aspects that must be considered when planning and implementing a project under a contractual arrangement. According to Eaton and Shepherd (2001) there is a range of factors that affect the success of contract farming. The essential pre-condition is that there must be a market for the product to ensure profitability of the project. The other factors include physical, social and cultural environments, the suitability of utilities and communications, the availability of land, the availability of needed inputs and government support in terms of law and an efficient legal system. Contract farming requires good management of the various operations of the contract.

Development of harmonious management-farmer relationships is important for successful contracting. Monitoring of the production performance and the employees of contractors that are in contact with the farmers is important. The final stage of the contract framework stresses the importance of feedback to both the farmers and the contractors. Well managed contract farming has proved to be an effective way to coordinate and promote production and marketing in agriculture (Eaton & Shepherd, 2001).
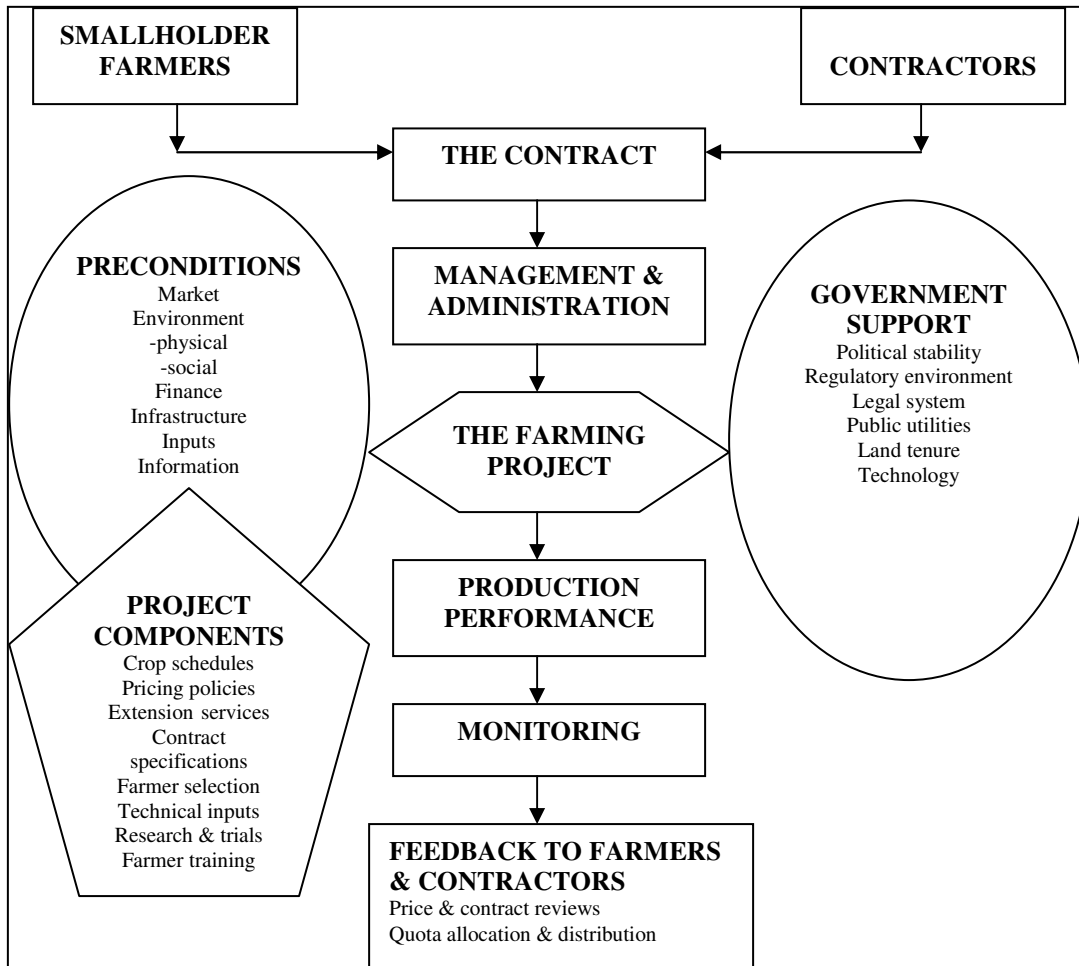
Figure 11: The contract farming framework
Source: Eaton & Shepherd (2001)

CHAPTER 8

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

8.1 Introduction

This chapter presents a summary of the thesis. Relevant conclusions are deduced and recommendations are made.

8.2 Summary

8.2.1 Background of the study

Sorghum and millet are important traditional cereal crops in Africa. They account for 23 percent of the cereal production of the Southern African Development Community (SADC) countries. These crops are important in marginal areas of southern Africa where other cereal crops such as maize and wheat would normally fail. The marginal areas are characterised by high temperatures, low and poorly distributed rainfall. The fertility of the soil is generally poor in these areas. Sorghum and millet are largely grown on a subsistence level and by smallholder farmers. They are usually grown without the application of major inputs like fertilizers. With the exception of a few countries such as Sudan, these crops are consumed by disadvantaged groups and hence the reason for being referred to as "poor people's crops". Sorghum and millet are not generally traded in international markets or even in local markets in many countries. Therefore, smallholder farmers seldom have an assured market in the event of surplus production. Though small grains have good potential for domestic and industrial uses, they have to compete with maize. There is, therefore, a need to look into the possibilities of improving marketing of sorghum and millet.

8.2.2 Data sources

The survey was targeted at smallholder communal farmer households in the Limpopo river basin in Zimbabwe and agribusiness firms that are involved with sorghum and millet in Zimbabwe. The research was conducted in two phases; Phase 1 was a reconnaissance survey with selected agribusiness firms while Phase 2 involved formal interviews with individual smallholder farmers.

Both primary and secondary data were used for this thesis. Primary data were collected from smallholder communal sorghum and millet producers (a mix of grain sellers and buyers), some of whom already are involved in marketing sorghum and millet at different scales of operation, and processors and other commodity firms who are currently buying from these farmers. Secondary data were obtained from the large volume of literature on farmer market participation and from company records.

Three districts, namely, Gwanda, Matobo and Chiredzi were purposively selected for the research. Their selection was based on the following criteria (i) sorghum and millet are widely grown, (ii) ICRISAT already has ongoing projects, such as conservation agriculture projects and on-farm trials for various crops including sorghum and millet, (iii) some farmers are already selling their produce. All the three districts underwent a reconnaissance survey. However, due to similarities in farming practices among farmers in these districts and proximity to ICRISAT location, only Matobo and Gwanda were included in the formal survey while Chiredzi, the furthest from ICRISAT, was dropped in the formal survey. Within the two selected districts, fours administrative wards were selected (Ward 8 and Ward 15 in Gwanda district; and Silebuho and Beula wards in Matobo district). Two villages were randomly chosen in each ward. A total of 195 households, belonging to eight villages, were randomly selected for the formal survey.

Stratified random sampling was used to select from existing feed, food and brewery industries; commodity brokers, financial institutions, agricultural retailers, NGOs and seed houses that source their raw material from smallholder farmers. This sampling method ensured that the different groups are represented in the sample, which was limited by the budget and time available for the interviews. A total of 14 companies were interviewed.

The primary data were complemented by secondary data that were obtained from a review of the large volume of literature relating to farmer participation in markets, company records on volumes of sorghum and/millet that the companies handle overtime and FAO per capita cereal consumption data. The purpose of the secondary data was to learn lessons from successful marketing arrangements on other crops and inform the recommendations for improving farmer participation in the marketing of sorghum and millet.

8.2.3 Characteristics of the sample

More than 50 percent of the sampled households were male headed in both districts. Over 30 percent of the sampled household heads in both districts were over 60 years of age. The majority of these (62 percent) were male heads. These high proportions give an indication of an aging agricultural labour force, which may have little interest in market participation compared to their younger counterparts, since their primary focus is food security.

There is a high literacy level of more than 80 percent among household heads in the surveyed districts. The literacy level of the household head is important in as far as it affects marketing decision-making by smallholder farmers. Male heads had higher literacy levels when compared to female heads, even if the difference was not significant. Literate farmers are more receptive to new ideas; therefore male headed households are likely to participate more in markets than their female counterparts when only literacy is considered.

The average household size is seven for both districts. Most resident household members worked full time on the farm. Household size, if taken as a proxy for availability of labour resources, shows that households would not have a serious problem of farm labour and are likely to adopt labour intensive technologies when only labour resources are considered. From the whole sample, female headed households had smaller household sizes (six members) compared to male headed households (seven members).

About 41 percent of the interviewed households in both districts were members of farmer groups/institutions in their area. This is a significant proportion indicating recognition of the importance of collective action within farming communities. Of these, 41 percent were female headed while 59 percent were male headed households.

More than 40 percent of the interviewed households were female headed. Migration, a key driver of the socio-economic situation, with perceived employment opportunities in urban areas and neighbouring countries stimulating movement of people, particularly men, explains this trend. In both districts, for example, people migrate to South Africa and Botswana in search of jobs. This

has resulted in a number of socio-economic changes in households. In at least 16 percent of the households, women take full responsibility for household issues while men seek employment (*defacto* female headed households). More than 20 percent of households in Gwanda and Matobo are *dejure* female headed. The high proportion is due largely to the impact of HIV/AIDS, which has led to death of mostly male heads migrating between countries in search of employment leaving women to run the day-to-day affairs of the family; besides those women who never married or are divorced.

8.2.3.1 Crop production

Sorghum was the most planted crop, followed by maize, groundnuts, bambaranuts, cowpeas and millet in Gwanda district. In Matobo district, the six major crops were; groundnuts, sorghum, millet, bambaranuts, maize and cowpeas. Millet was more common in Matobo when compared to Gwanda. This is partly because the surveyed part of Matobo district (south half) is much drier than Gwanda and the majority of inhabitants are of the Khalanga tribe whose traditional staple grain has always been millet. Most farmers preferred sorghum to millet because sorghum is less prone to quelea birds attack, sorghum is easier to process than millet and also the colour and taste of sorghum meal is more preferred to millet meal. Most of the sorghum grown was red sorghum due to non-preference by quelea birds.

Maize had the highest mean cultivated area, followed by sorghum and millet in Gwanda district while in Matobo, sorghum and millet were the highest with maize coming third on the list. Between 2004 and 2007, maize had the highest mean crop production, followed by sorghum and millet. These findings are consistent with literature that maize is preferred to small grains, though production levels are low for all the crops. Although the 2004/05 season was not a good season, maize still performed better than the small grains.

Farmers face constraints in the production of sorghum and millet, and the most commonly cited constraint was quelea birds. The threat of quelea birds on white sorghum and millet has acted as a major deterrent to production of these crops. Drought, pests (such as armoured crickets and aphids, and grain storage pests), unavailability of seed, eating and trampling of crops by

elephants, witch weed occurrence, shortage of fertilizer, shortage of draft power, lack of farming equipment, shortage of manure and shortage of labour. Processing of small grains is also a complex and labour-intensive exercise and it has been another major disincentive to small grain production. Manual threshing of sorghum and millet produces dust that causes severe itching of the skin and this has discouraged many farmers from producing these crops.

8.2.3.2 Livestock production

In addition to crops, smallholder farmers' livelihood depends on livestock production. A higher proportion of Matobo households owned cattle and donkeys compared to Gwanda households. The ownership of cattle and donkeys was slightly skewed towards male headed households. At least 40 percent of the households interviewed in both districts did not own any cattle and about 17 percent did not own donkeys. This is an indication of the proportion of households without access to draft power in the studied areas. At least 90 percent of households in both districts owned goats. Matobo district had the highest proportion (96 percent) of households owning goats. Contrary to the case with cattle, a higher proportion of female headed households owned goats compared to male headed households. A high proportion of households owned chickens partly because non-governmental organisations like World Vision have distributed chickens to vulnerable communities under the poverty alleviation and enhancement of rural livelihood strategies programs. Goats, sheep and chickens are a common source of income and an important source of meat, milk and manure.

8.2.3.3 Sources of household income

The five major sources of household income are vegetables, livestock, casual labour sales, field crops and remittances. When farmers were asked to rank the three top most important income sources, livestock was ranked number one. Male headed households relied more on livestock for income than female headed households. Female headed households on the other hand are dependent on vegetable sales and livestock is second followed by remittances.

8.2.3.4 Membership to farmer groups

Collective action was mainly in the form of membership to farmer groups/institutions that community members voluntarily join and in some instances paid joining and subscription fees. Of the 41 percent households who were members of farmer groups, 41percent were female headed while 59 percent were male headed households.

Most of the farmer group activities were agricultural related. These activities included labour pools during periods of peak labour requirements, on-farm trials with NGOs promoting certain crop varieties or cropping technologies, crop production specifically for sale to increase household income, loaning each other draft power, livestock rearing at a central kraal to help poor farmers restock, NGOs distributing seed and teaching farming skills and conservation agriculture. In addition to agricultural activities, farmers provided financial and labour assistance during funerals, and farmer groups acted as savings clubs for future cash requirements. Of the 80 farmers that were members of farmer groups, only 21 percent participated in markets. The majority of farmers who were not members of any group did not have any group to join in their area or were not aware of the importance of farmer associations.

8.2.3.5 Sources of information on prices and marketing of grain

The sampled households obtained information on marketing and grain prices from neighbours, the GMB, other farmers in nearby irrigation schemes, grain traders, the Agricultural Technical and Extension Service (AGRITEX), nearby towns and local shops. The importance of neighbours as the most common source of information on marketing and prices demonstrates the significance of farmer-to-farmer knowledge pathways. Male headed households received most of their marketing information from other farmers in irrigation schemes and from traders while female headed households got most information from AGRITEX and nearby towns.

8.2.4 Data analysis

Empirical analysis was based on the primary data collected in a formal survey of the 195 randomly selected sorghum and millet smallholder producers. A combination of econometric

methods was used to analyze the data. The factors influencing participation in markets by smallholder farmers was estimated using two econometric models, namely, the multiple regression model used to estimate the effect of transaction cost related factors on quantity sold and the probit model used to estimate the probability of a farmer selling some grain. A discriminant function analysis was run to determine discriminating variables between the two groups of sorghum and millet sellers and non-sellers. To determine the nature of the discrimination between the two groups of farmers, descriptive analysis was employed.

8.2.5 Major findings of the study

8.2.5.1 Existing marketing arrangements in Zimbabwe

Contract farming has been in existence in Zimbabwe for a long time now and different companies contracted specific commodity crops over time. The contracts are offered to either groups of farmers or to individual farmers. Contractors offered some production inputs and specific services such as free transport for farmers who met the contract conditions. However, among the sampled households, none were in farming contracts and the major buyer of their sorghum and millet were neighbours. Only a small proportion (30 percent) of the interviewed farmers sold sorghum and/millet. Some farmers (32 percent) exchanged/barter traded their grain for other commodities like maize grain, groundnuts, small stock, school uniforms, as payment for labour, etc.

8.2.5.2 Sorghum and millet marketable surplus

The domestic cereal balance for the three major food crops, namely, maize, sorghum and millet is negative; meaning that current household production levels fall far below the family daily food requirements. This therefore explains the poor participation in markets. With this type of households that are both producers and consumers and with rare alternative income sources, for farmers to be able to sell grain, productivity should be increased to first ensure adequate annual food supply for the household. Participation in the market and the amount of grain sold would

then depend on the net position of the household. Often households sell only the proportion of produce that is not used for subsistence.

8.2.5.3 Transaction cost related factors and market participation for sorghum and millet smallholder farmers

Results of the multiple regression model estimating the effect of transaction cost related factors on quantity sold showed that previously agreed prices (PRICEAGREE) influence the quantity of grain sold significantly. Road access (ROADACCESS), confidence and trust in the buyer (CONFIDENCE) and membership to a farmer group/institution (MEMBERSHIP) were not significant yet have a significant impact on the quantity of grain sold.

The probit model results showed that pooled transportation to the market (POOLING), loss of grain through transportation (LOSS) and membership to farmer groups/institutions (MEMBERSHIP) did not influence the probability of farmer participation in markets. However, three explanatory variables were significant in influencing the probability of farmer participation in markets. These were confidence and trust in the buyer (CONFIDENCE), the difference in price knowledge (PRICEKNOW) and delayed payment for sold grain (DELAYPAY). To note is that together the significant and non-significant variables have a significant impact on the probability of farmers participating in markets.

8.2.5.4 Factors distinguishing sellers and non-sellers of sorghum and millet

The discriminant function analysis found six predictors that explained the difference between the two groups of farmers; grain sellers and non-sellers. The number of donkeys that a household owned contributed the most to the prediction of group membership. The second most important predictor was the household's level of crop production followed by source of household income, the method of transporting grain to the market, the district in which the household is located and the total area that the household cultivated.

8.2.5.5 Strategies for improving participation of smallholder farmers in the marketing of sorghum and millet

Farmers identified issues that need to be addressed for sorghum and millet production and marketing to be improved. These included seed unavailability, lack of access to draft power, lack of access to fertilizer, establishment of irrigation schemes, provision of transport to the market, production of marketable surplus and establishment of a local market. All these suggestions point to the need for external assistance to farmers, which according to literature, can be secured through contracting. Contracting would ensure input provision, competitive product pricing, improved production technology, access to information, consistent grain quality and supply, and hence improved productivity.

8.3 Conclusions and recommendations

One of the most apparent observations from the analysis is that although sorghum and millet are important food crops for smallholder farmers in the Limpopo river basin, their productivity is very low. This prompts questions about the future of small grains. The low productivity suggests that crop production in the basin may not be sustainable given the climatic conditions and that it may be better suited to extensive livestock production. However, judging from successes in maize production, improvements in production technology can dramatically change the comparative advantage of small grains production. Agricultural development and food security initiatives for the Limpopo river basin must therefore focus on sorghum and millet production systems. Increasing productivity, to ensure adequate food supply that satisfies the family daily food requirements first, could improve the competitive position of sorghum and millet in markets. It is clear from the Cereal balance sheet that current production levels cannot meet daily food requirements. Households often sell grain that is not used for subsistence or sell out of distress to meet pressing cash needs. Participation in sorghum and millet markets would therefore rely on the net position of the household after family food needs are met. Technology and policy options that will enhance incentives to increase production will have a great, though indirect, impact on motivating market participation.

There are various existing contracts for different commodity crops in Zimbabwe. The brewing industry emerged as a major contractor of small grains, particularly, sorghum. The presence of other successful contracts for other commodity crops is an indicator of the potential to increase marketing of sorghum and millet through contracting. To further develop the sorghum brewing industry in Zimbabwe, it is essential that the competitive edge of sorghum is both maintained and extended. Shifting market policies, improving prices, changing regulations, and reducing subsidies favouring maize could also provide incentives to produce and consume these crops. Improved production would definitely enhance market development since there appears to be a vicious cycle; low surplus production constrains development of markets, which in turn constrains smallholder farmers' ability to adopt productive farm technologies in a sustainable way, reinforcing subsistence/semi-subsistence agriculture. Identifying a few alternative uses for sorghum and millet would yield new avenues for increased utilization and thus act as a catalyst to improve productivity. For example, development of ready-to-eat products from sorghum and millet that could be sold by street vendors would open up new avenues of utilization.

Transaction costs are an important determinant of the extent of market participation for smallholder farmers. Results of the multiple regression and the probit models showed that transaction cost related factors, such as previously agreed prices (PRICEAGREE), confidence and trust in the buyer (CONFIDENCE), the difference in price knowledge (PRICEKNOW) and delayed payment for sold grain (DELAYPAY) have a significant impact on the quantity of grain sold and the extent of farmer participation in the market. Based on this analysis, it is important for farmers to receive timely price and market information in a simplified manner. This can be done by providing simplified market trend analysis trainings, provision of market requirement fliers to the agricultural extension officers on a continuous basis. Furthermore, this information should be made available to the farmers in the language that they can understand. It is also important to improve road infrastructure and establish local markets, which will reduce costs associated with transporting grain to the market. Alternatively, rather than focusing exclusively on reducing transaction costs, contractors may develop mechanisms to recover these costs through the use of differentiated contracts.

Six predictor variables were found to be major discriminating features between sorghum and millet sellers and non-sellers. The variables that were important included; the number of donkeys, household's level of crop production, source of household income, the way a household transports grain to the market, the district in which the household is located and the total area that the household cultivated. The identified predictors can be viewed as marketing constraints, which when addressed would ensure improved market participation. Most of these discriminating variables point to wealth-ranking factors or household asset endowments implying that poorer households are unable to participate in markets effectively.

Farmers identified issues that need to be addressed for sorghum and millet production and marketing to be improved. The major issues included; seed unavailability, lack of access to draft power, lack of access to fertilizer, establishment of irrigation schemes; provision of transport to the market, production of marketable surplus and establishing a local market. All these point to the need for external assistance to farmers. A review of literature has shown that contracting can offer smallholder farmers strategic benefits. Well managed contract farming has proved to be an effective way to coordinate and promote production and marketing in agriculture. For contracting to succeed, it is necessary to improve sorghum and millet productivity with an assured quality of the grain. Therefore, there is need to improve the production technologies for the small grains and disseminate the knowledge to the rural smallholder farmers. It is only in this way that small grains can compete with maize.

Interventions by government and private sector in sorghum and millet marketing should aim at improving productivity, reducing the transaction costs that farmers incur, and addressing the major factors that discriminate grain sellers from non-sellers. Important to note is that, if poorer households are unable to effectively participate in markets, then interventions to increase households' productive assets or the public goods that support agricultural production and marketing may be necessary.

8.3.1 Contract farming as a strategy for improving market participation of smallholder sorghum and millet farmers

As in many cases, smallholder farmers cannot be competitive without access to the services provided by contract farming companies. Resource-poor smallholder farmers require interlocked contracts (as opposed to verbal agreements), which entail the contractor providing a vertically integrated package which might include provision of basic farm inputs, credit facilities, marketing services (collection, sorting, transport, storage, etc) as well as technical advisory services[10]. Under this type of contracts, the producer is required to sell all his/her produce to the contractor, whereupon the cost of some or all of the inputs provided on credit is deducted from the income realized. Interlocked contractual arrangements are critical to the commercialization of smallholder sorghum and millet production since rural financial and input markets are generally poorly developed or non-existent in Zimbabwe.

Below are suggested key intervention ingredients for the future of sorghum and millet in Zimbabwe. The suggested settings revolve around improving sorghum and millet marketing in Zimbabwe through contractual arrangements. If the contract farming framework presented in Chapter 7 could be implemented together with the suggested intervention ingredients given below, this could be an effective way to coordinate and promote production and marketing in the smallholder agricultural sector of Zimbabwe.

8.3.1.1 Key intervention ingredients for contracts with formalized groups
- Involvement of both government and private sector in farmer training and formation of formalized groups or business commodity associations. Farmers have to function through organized groups to supply quality in large quantities, to increase their bargaining power and for collective action to exploit economies of scale. This would reduce the costs normally associated with working with individual smallholder farmers and incorporate rural economies into the mainstream economy and ensure skills sharing among farmers.

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[10] Interlocking is defined as provision of seasonal inputs on credit using the borrowers' harvest of the crop in question as collateral substitute to guarantee loan repayment.

- Contractors should provide funding for critical inputs, such as, improved seed, fertilizer, transport, etc.

- Provision of incentives to reward the best producers. This would encourage more participants to sign into contracts.

8.3.1.2 Key intervention ingredients for value addition targeting a niche market

- A specific industry, for example, the milling industry, could deal with a group of selected farmers in sorghum and millet high potential districts in the formation of a complete value chain for sorghum and millet.

- Involvement of smallholder farmers in production, value addition until sale of the final products in an identified niche market. This is borrowing from an observation by some sorghum and millet sub-sector players that sorghum and/or millet meal would survive simply as a specialty product; therefore important to identify niche markets.

- The development of numerous ways of sorghum and millet utilization. This will increase demand hence increase production of a marketable surplus.

8.3.1.3 Key intervention ingredients for selective partnering with groups of farmers in different wealth rankings

- Selective partnering with smallholder farmers because smallholder farmers are a heterogeneous group whose resources, livelihood patterns and income sources are quite diverse. Because they are not homogenous, their needs are also different. Depending on their income sources, their location, other socio-economic and demographic factors, and the variety of costs they come across in their day to day living, they often have different responses to changes in economic variables and policy actions. In the formation of commodity associations, the poorer farmers (according to the community's wealth ranking criteria) should be classified differently from the relatively wealthy farmers to avoid the risk of exclusion and crowding out.

- Each group should be attached to a specific buyer who would engage them on an input credit scheme prescribed collectively by the farmers and the contractor. This would also avoid unnecessary expenditure on inputs that some farmers can afford on their own. For example, for those farmers who do not have adequate draft power, tillage could be

provided by a large commercial farmer who is located in close proximity to the smallholder farmers and is contracted and paid by the contractor to provide the vital service. This approach has been proven to work well by Irvines Day Old Chicks in its grain production contracts.

8.3.2 What is the role of government?

An important requirement for contract farming is government support. Contract farming is not about availability of resources, other fundamentals have to be met e.g. technical and policy requirements. Contracts need to be backed up by law and by an efficient legal system. It therefore requires a conducive regulatory framework to ensure efficient enforcement of the contracts. Identified priority areas that define a conducive environment are technology, finance, physical infrastructure, human resource development, information, the regulatory environment and the macro-economy in general. The conducive environment must be able to address the identified constraints outlined in Chapter 2. According to BIDPA (1999) the government is probably the largest sector with the most influence on these priority areas. Hence, the importance of government policies and programmes. The government should ensure that the legal environment is suitable and help the industry to be efficient. Alternatively, the government can adopt a hands-off approach; if the government is to be involved, a balance between benefits to the buyer/contractor and to the sellers/farmers has to be carefully struck otherwise contract farming would not work.

Through its AGRITEX division, the government could introduce and intensify extension worker training to include commodity post harvest handling and marketing. AGRITEX is a technical wing of the government whose major involvement comprises provision of professional advice to farmers, providing agricultural training to farmers, conducting field trials and projects, conducting research and its application in relation to problems faced by farmers.

8.4 Limitations of the study

- Having an extension officer in the team, studying ICRISAT's project districts and wards and the mention of ICRISAT's involvement created an impression that the survey was probably ICRISAT's effort to give farmers seed, as was previously done in the survey areas. However, repeated explanations of the specific objectives of the survey ensured the bias was kept minimal.

- During the questionnaire administration process, some traditional leaders and households still expected free seed assistance. Although efforts were made to clearly explain the purpose of the survey and that no assistance was going to be given for responding to the questionnaire some respondents may not have been clearly convinced that the survey had nothing to do with free sorghum seed handouts. Given this observation there might be some biases, however, very limited, on total crop production levels and major challenges in sorghum and millet production.

- Conversion of farmers' units of measurement into standard measures such as kilograms or tons. Farmers would give measurements such as number of cups, buckets for the different types of crops. Since different grains would weigh differently for say the same size bucket, it was difficult for these conversions to be done in the field by the enumerators. The problem was reduced by a series of trainings before and during fieldwork. Enumerators were also encouraged to record the unit of measurement as given by the farmer, and then follow-up conversions were done during data analysis.

8.5 Implications for policy and research

8.5.1 The market participation impacts of policy interventions

The decline in absolute and relative importance in terms of production and consumption of small grains has not yet been well explained or addressed in policy decisions. There is need to address

policy issues that could influence the performance of the sorghum and millet subsector, particularly the relatively low productivity of these crops.

In order to be able to directly study the impact of different policy interventions on smallholder market participation, one would need longitudinal data on smallholder farmers and the means to identify induced behaviour changes. Available literature, has not pointed to the availability of such studies, certainly not with respect to small grains. Lack of studies on the impact of policy interventions on smallholder market participation sharply limits the empirical evidence base on which to make inferences as to what effect different policies have on market participation behaviour. The available evidence offers indirect evidence as to the kind of interventions most likely to stimulate increased market participation. The central themes that stand out in literature are that the key policy interventions to induce increased market participation are aimed at reducing the transaction costs of households' access to local and international markets and of organizing farmers into associations, as well as policies to stimulate increased trader competition. It is therefore important to conduct direct studies to determine what policy interventions would stimulate increased smallholder market participation for small grains.

8.5.2 Market participation and the role of extension workers

As smallholder farmers become more market oriented, so extension workers need to be in a position to advise them not only on how to grow crops but also on how to market them. Knowledge of produce handling, storage, packaging and market research is essential. Marketing training for extension workers is therefore vital. This way, they will be able to answer farmers' questions about prices, about whether to store their crops or sell immediately and about where to buy and various ways of paying for inputs such as fertilizer and seed. Farmers seeking to produce new crops need to be aware not only of their likely production costs but also of the costs of marketing these crops. Extension workers need to be able to advise them on such matters.

8.5.3 Areas of future research

The primary theme in literature and in this study on smallholder market participation is the importance of transaction costs. An area of future research could be an understanding of the characteristics of transactions as well as the institutional governance related to specific transactions in the marketing of sorghum and millet. A good example is the global value chains, where increased trends in private voluntary standards are affecting smallholder transactions and the structure and characteristics of markets.

The surveyed households were a mixture of sellers and buyers because sampling lacked a clear distinction between the two types of farmers. The number of farmers selling was small which may have affected the results. Further surveys on market participation and collective action should aim at a clear analysis of net sellers against net buyers to determine distinguishing features between the two groups. This study could not clearly distinguish between the two groups because the sample was a mix of buyers and sellers and the number of sellers was too small. It will be worthwhile exploring in future empirical work what optimal combinations of discriminant features will prove to be effective in converting smallholder farmers into market participants. This may uncover additional factors explaining differences between grain sellers and non-sellers.

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Annexure 1: The Limpopo River basin in Zimbabwe: Location of the study districts on the river basin
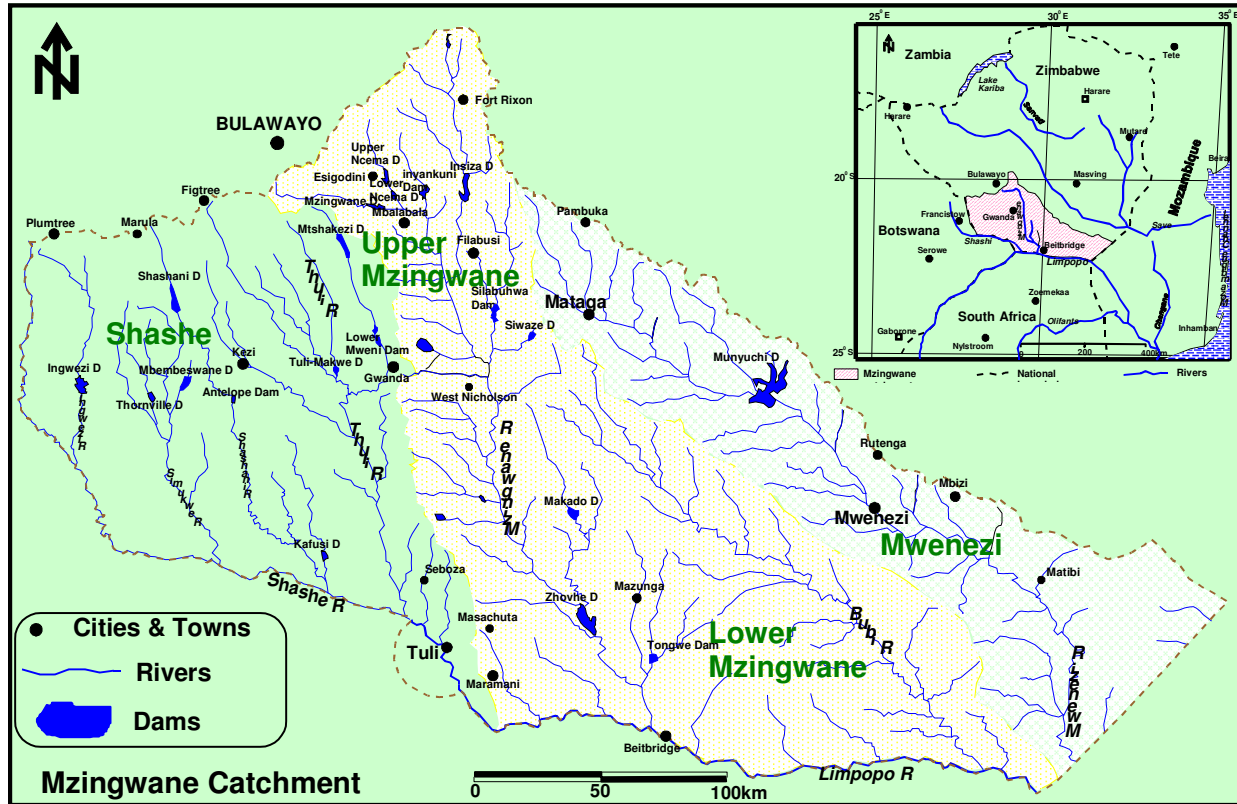
Annexure 2: The survey questionnaire

Date: ---------------------------------------**Name of Enumerator:** ---

District: -----------------------------------**Ward:** ----------------------**Village:** --------------------------

A: Household Characteristics

1. Name of respondent--------------------------------------

2. Position of respondent in household,

	Household head	1
(*tick appropriate*)	Spouse of head	2
	Brother	3
	Sister	4
	Son	5
	Daughter	6
	Other (*specify*)	7

…………………

3. Name of farmer: --------------------------------------

4. Status of farmer in household (*tick appropriate*)

Dejure Female head (single/widowed)	1
Defacto Female head (husband away)	2
Male head	3
Child head	4

1. What is the **age** of the farmer *(in years)*? *(Tick appropriate)*

1$\leq$ 20	**2**=21-30	**3**=31-40	**4**=41-50	**5**=51-60	**6**>60

2. What is the highest **educational level** attained by the farmer?

1=illiterate, 2= primary education, 3=secondary education, 4= advanced/Tertiary, 5=other (SPECIFY!)--

3. Total number of permanent household members *(members stayed for 3 or more months continuously)*

B: Crop Production

4. What are the six major crops grown and area under each *(Complete table below)*

Crop grown	Area *(record Acres/Ha as given by farmer)*	Total production *(record units given by farmer)*		
		2004/05 season	2005/06 season	2006/07 season

C: Livestock Production

5. **How many animals, by type** do you currently own *(complete table below)*?

	Cattle	Goats	Sheep	Donkeys	Poultry
Breeding females					
Young females					
Males (intact & castrated)					
Calves/kids lambs					

D: Collective Action

6. Are you a member of any association or farmer group? **1**=Yes **0**=No

(If No, skip to Que. 11)

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7. If yes, what is the name of the group? --
----

8. When did you join the group *(year and month)*? ---

9. Why did you join that group? --

----

10. What are the group's activities? ---

----

11. If No, why are you not a member of any group? ---

E: Sorghum and Millet marketing

12. Do you normally sell your sorghum? **1**=Yes **0**=No

    12(a) If yes, who usually buys your grain *(list all buyers)*? --
    ----

    12(b) For how long have you been selling sorghum (years)? ----------------------------------

13. Do you normally sell your millet? **1**=Yes **0**=No *(If No, skip to Que. 22)*

    13(a) If yes, who usually buys your grain *(list all buyers)*? --
    ----

    13(b) For how long have you been selling millet (years)? --------------------------------------

    13 © Do you sometimes exchange sorghum/millet for other commodities? **1**=Yes **0**=No

14. How much did you sell, each year, for the past 3 years (kg)?

Sorghum sold (kg)			Millet sold (kg)		
2004/05 season	**2005/06 season**	**2006/07 season**	**2004/05 season**	**2005/06 season**	**2006/07 season**

15. How long do you have to travel to your most important market/buyer *(km/walking time)*?

   ----

16. How do you transport your grain to the market? **0=**Individually **1=**Coordinated transport

17. If coordinating with other farmers, how often did you do that in the past 3 years?

   0=Never/few times   **1=**Usually/Always

18. Would you rate your road access to the market to be poor or good? **0=**Poor **1=**Good

19. Do you experience any grain losses when you transport grain to the market? **1=**Yes **0=**No

   19 (a) If yes, how would you rate amount of grain lost?

   0= Significant amount   **1=**Insignificant amount

20. Do you usually know about grain prices before going to the market? **1=**Yes **0=**No

   20 (a) If yes, where do you get information about prices *(list all market information sources)*?

   ----

   13 (b) Is the actual price at time of sale usually the same as the one you know?

   1=Yes **0=**No

21. If no, why?---
   ----

22. Who determines the selling price? ---

   ----

23. Do you usually agree with the buyer on the price of your product? **1=**Yes **0=**No

   23(a) If yes, at what point do you agree with your buyers on the price?

   0=At time of sale   **1=** By previous agreement

24. Do you sometimes have to approach the buyer to negotiate prices? **1=**Yes **0=**No

   24(a) If yes, how many times in the past 3 years have you had to approach the buyer to negotiate prices before selling *(complete table below)*?

Sorghum sales			Millet sales		
2004/05 sales	2005/06 sales	2006/07 sales	2004/05 sales	2005/06 sales	2006/07 sales

25. Have there been delays in payments for sold grain? **1**=Yes **0**=No

    25(a) If yes, how many times did you have to approach the buyer for payment in the past 3 years *(complete table below)*?

Sorghum sales			Millet sales		
2004/05 sales	2005/06 sales	2006/07 sales	2004/05 sales	2005/06 sales	2006/07 sales

26. Have there been delays in sales at the market? **1**=Yes **0**=No

    26(a) If yes, what was the cause of the delays? --- --

27. How long do you normally wait to sell produce in the market?

    0=Very quickly   **1**=More than 2 hours

28. How often did you fail to sell/ return home with your grain in the past 3 years?

    0=None   **1**= Several times   *(If none, skip to Que. 30)*

29. What were the reasons? *1=price too low, 2= too few/no buyers available, 3=grain quality rejected, 4= sale postponed, 5= Other (specify)*---

30. Do your buyers recognize quality of grain? **1**=Yes **0**=No

31. Do your buyers sign out receipts for the grain? **1**=Yes **0**=No

    31(a) If No, why not?--- --

32. How confident are you in your buyers?   **0**=Low   **1**=High

    32 (a)Explain--- --

33. What are the major costs you incur in selling your grain? *1=transport, 2= packaging, 3= grain threshing and cleaning, 4= costs while waiting at the market (e.g. food, accommodation, etc), 5= Other (specify)*---

34. Did you have production and/marketing contracts with any company for sorghum in the past 3 years? **1**=Yes **2**=No

34(a) If yes, describe your arrangement---

34(b) If no, why not? --
----

35. Did you have production and/marketing contracts with any company for millet for the past 3 years? **1**=Yes **2**=No

35(a) If yes, describe your arrangement---

-- --

35(b) If no, why not? --
----

36. Have you ever had any production/marketing relationship with processors or commercial buyers of small grains since you started selling grain? **1**=Yes **2**=No

36 a) If yes, what was it about?---

----

37. What marketing problems/challenges do you encounter when you sell your grain?----------
----
----

38. Do you think there is a ready market for sorghum in our country? **1**=Yes **2**=No

38(a) If yes, explain? --

38(b) If no, explain? --
----

39. Do you think there is a ready market for millet in our country? **1**=Yes **2**=No

39(a) If yes, explain? --

39(b) If no, explain? --

----

40. What do you think can be done to improve production of sorghum and millet? --------------
----
----

41. What do you think can be done to improve marketing of sorghum and millet? --------------
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F: Sources of Household Income

42. Where do you get household income? Rank your income sources in order of importance *(complete table below).*

1= *livestock,* **2**=*field crops,* **3**=*vegetables,* **4**= *remittances* **5**=*beer brewing,* **6**=*craft,* **7**= *casual labor sales,* **8**=*formal employment,* **9**=*gold mining,* **10**=*Other (SPECIFY)*

Rank	Income source
1	
2	
3	
4	
5	

43. Any other comments/suggestions? --

THANK YOU

Annexure 3: Results from the discriminant function and multiple regression analysis

Table A: Discriminant analysis results - Wilks' Lambda

Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1	.736	58.134	6	.000

Major differences between the two districts

Table B: Small grain production (kg) in the sampled wards (2004/05-2006/07 seasons)

	Whole sample				Grain sellers only			
	N	Min	Max	Mean	N	Min	Max	Mean
Ward 8	49	10	2160	458 (533.23)	17	68	2150	665 (523.68)
Ward 15	50	43	3850	911 (826.32)	6	150	3750	1563 (1508.04)
Silebuho ward	51	0	2500	651 (556.09)	8	317	2500	1408 (766.94)
Beula ward	45	26	5310	677 (844.07)	4	300	5310	1714 (2408.15)

Ward 8 in Gwanda is wetter than all the other wards that were studied and it is the closest to town. This could have influenced sale of grain as 17 out of the 35 sellers are in this ward. However, the mean production levels between the two districts are not significantly different. Because of the higher rainfall levels, farmers in Ward 8 grow more maize than farmers in the other wards, hence they can afford to sell the small grains they would have produced. Literature has shown that people prefer maize based food to sorghum and millet based food (Mafuru *et al.*, 2007).

Table C: Farmers' suggestions for improving marketing of sorghum and millet in Zimbabwe (n=256)

Suggestion	% of responses
Provision of transport to the market	24.6%
Production of surplus	19.1%
Establishment of a local market	14.8%
Price controls	10.5%
Exposure to big markets	7.4%
Farmer education	4.7%
GMB visit more often	3.9%
Contracts with breweries	3.5%
Formation of groups	2.7%
Provision of draft power	2.3%
Irrigation schemes	2.0%
Provision of fertilizer	1.2%
Access to information	1.2%
Early/Dry planting	0.8%
Provision of farming equipment	0.4%
Bird control	0.4%
Elephants, livestock & baboon control	0.4%