POTENTIAL OF SORGHUM AND FINGER MILLET TO ENHANCE HOUSEHOLDFOOD SECURITY IN ZIMBABWE'S SEMI-ARID REGIONS: A REVIEW

By

Mukarumbwa, P. and Mushunje, A.

Contributed Paper presented at the Joint 3rd African Association of Agricultural Economists (AAAE) and 48th Agricultural Economists Association of South Africa (AEASA) Conference, Cape Town, South Africa, September 19-23, 2010.

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ABSTRACT

Successive droughts, in Zimbabwe compounded by other economic shocks in recent years have resulted in decreased maize productivity amongst the communal farmers most of whom reside in regions IV and V which are considered semi-arid. This has given rise to the need to find alternative food crops, which may be suitable for these areas. Generally, research in the world indicates that sorghum and millet have the potential to end chronic food insecurity in semi-arid areas because of their drought tolerance. Whilst this might be the case, research, government policy and assistance from non-governmental organizations on food crop production in Zimbabwe have shown a continual inclination to maize production in semi-arid areas. However, maize is regarded as a high risk crop in these regions. The main objective of this paper is to review relevant literature on the potential contribution of small grains to alleviate household food security in semi arid regions of African countries with specific focus on Zimbabwe. These findings will enable developing countries to craft a policy shift that encourage increased production of finger millet and sorghum in their semi-arid regions. It is suggested that this may increase household food security in these regions.

Key words: *semi-arid, sorghum, finger millet, small grains, food security*

INTRODUCTION

Agriculture plays an important role in the development of the Zimbabwean economy through its impact on the overall economic growth, households' income generation and food security (Mlambo and Zitsanza, 2001). According to Juana and Mabugu (2005), it offers income and employment to about 70% of the population, 60% of the raw materials required by the industrial sector and is the largest export earning sector contributing about 45% of total exports in most years. As such, the sector creates employment opportunities for about 25% of the total work force in formal employment and contributes an estimated 17% of Gross Domestic Product (GDP) (Tekere and Hurungo, 2003). In comparison other sectors such as mining, manufacturing, electricity, construction and services contribute five percent, twenty seven percent, three percent, three percent and 47 percent respectively to the GDP (Juana and Mabugu, 2005).

Therefore, the pivotal role that agriculture plays in the Zimbabwean economy warrants that policies designed regarding household food security and the type of crop to be produced should be guided appropriately. Focus should be directed to communal farmers who reside in semi-arid regions (regions IV and V). This is because most of Zimbabwe's communal lands lie in the marginal agro-ecological region IV and V. FAO (2006) estimates that about 70% of Zimbabwe's communal lands lie in regions IV and V.

According to FAO (2008), findings large parts of the SADC are semi-arid, with erratic rainfall and nutrient poor soils. While maize is the major staple that is grown in this region as a whole, sorghum and millet were found to be important crops in these driest regions where rural farm households have limited production capacity and lowest incomes (FAO, 2008). Sorghum and millet being drought tolerant have a strong adaptive advantage and lower risk of failure than other cereals in such environments. In Zimbabwe, like other countries in the SADC region, production of the main staple maize continues to dominate in its semi-arid areas.

Zimbabwe is divided into five agro-ecological regions known as natural regions based on the rainfall regime, soil quality and vegetation among other factors (FAO, 2006). The quality of the land resource declines from Natural Region (NR) 1 through to NR V (Rukuni *et al.*,

2006). Table 1.1 below summarizes the rainfall patterns in Zimbabwe's natural regions and the type of farming systems that are practiced in each region.

Table 1.1: Zimbabwe's Natural Regions and Types of Farming Systems in each region

Natural Region	**Area (000 ha)**	**% of total land area**	**Annual rainfall (mm)**	**Farming Systems**
I	613	1.56	> 1 000. Rain in all months of the year, relatively low temperatures	Suitable for dairy farming, forestry, tea, coffee, fruit, beef and maize production
II	7 343	18.68	700-1 050. Rainfall confined to summer	Suitable for intensive farming, based on maize, tobacco, cotton and livestock
III	6 855	17.43	500-800. Relatively high temperatures and infrequent, heavy falls of rain, and subject to seasonal droughts and severe mid-season dry spells	Semi-intensive farming region. Suitable for livestock production, together with production of fodder crops and cash crops under good farm management
IV	13 010	33.03	450-650. Rainfall subject to frequent seasonal droughts and severe dry spells during the rainy season	Semi-extensive region. Suitable for farm systems based on livestock and resistant fodder crops. Forestry, wildlife/tourism
V	10 288	26.2	< 450. Very erratic rainfall. Northern low veldt may have more rain but the topography and soils are poor	Extensive farming region. Suitable for extensive cattle ranching, forestry, wildlife and tourism. Zambezi Valley is infested with tsetse fly.

(Source: Adapted from FAO, 2006)

Natural regions IV and V where most communal farmers reside and derive a living are too dry for successful crop production without irrigation but they grow crops in these areas despite the low rainfall. Millet is a common crop but most communal farmers also grow maize which is the preferred staple (Rukuni *et al*., 2006). The relative ratio of land allocation per crop and yield suggests that farmers in NRs II have a comparative advantage in the production of maize and cotton (FAO, 2006). FAO (2006) further explains that farmers in NR III have a comparative advantage in the production of cotton followed by maize. For farmers

in NRs IV and V, their comparative advantage is in the production of small grains (FAO, 2006).

Leuschner and Manthe (1996) points out that sorghum and millet are some of the most important cereal crops for communal farmers in Natural Regions IV and V of Zimbabwe. The regions are characterized by low, erratic and poorly distributed rainfall of less than 650 mm/year as shown in Table 1.1. Research has shown that in these regions small grains have the potential of stabilizing household food security (Leuschner and Manthe, 1996). However, yields of sorghum and millet are still very low in these areas because communal farmers use low yielding varieties (Leuschner and Manthe, 1996). This has also been attributed to inadequate government support to promote these small grains.

The above scenario has been compounded by the fact that in recent years, Zimbabwe's economy has been experiencing multiple shocks. For the past ten years since 1999, the economy has been ravaged by widespread rainfall deficits, the impact of HIV/AIDS and an acute foreign currency shortage which has resulted in a livelihoods crisis for the majority of the country's rural and urban poor (FAO, 2008).

A Consortium for Southern Africa Food Security Emergency (C-SAFE) has been trying to address acute food security problems in Zimbabwe (Devidze, 2006). It successfully piloted a scheme called Market Assistance Programme, which was being administered by Catholic Relief Services (CRS) in 2003 (Devidze, 2006). Under this programme, sorghum is imported into Zimbabwe from America, transported into the country, milled and packaged into 5kg bags. These bags are then delivered to vendors who in turn sell the product at a subsidized price to the targeted urban poor in high density areas in particular towns. This has been happening in Mutare, Bulawayo and Hwange (Devidze, 2006).

However, aid has been coming into Zimbabwe in this form of small grains such as sorghum, despite the Zimbabwe government's efforts to revive agriculture after the fast track land reform programme. The government has been offering subsidized inputs in the form of mainly maize seed and fertilizer to resettled farmers and communal farmers. Nonetheless, Foti *et al* (2007) suggests that not much benefit has been achieved from the government subsidized input scheme especially in these semi-arid regions because input packages and the variety that was being issued did not tally with the agro-ecological location of the farmer.

These views are further supported by FAO (1996) that Zimbabwe government support measures for small grains have been shown to be relatively minimal compared to maize, and the latter has encroached into sorghum and millet land. This is despite previous studies that have shown that small grains have a comparative advantage in these semi-arid regions over maize.

ADAPTABILITY OF SORGHUM AND MILLET TO SEMI-ARID ENVIRONMENTS

Sorghum and millet have been noted as staple food grains in many semi-arid and tropic areas of the world, particularly in Sub-Saharan Africa because of their good adaptation to hard environments and their good yield of production (Dicko *et al*., 2005). Taylor *et al* (2006) expands on Dicko *et al's* findings by describing sorghum and millet as generally the most drought-tolerant cereal grain crops that require little input during growth and with increasing world populations and decreasing water supplies, represent important crops for future human use.

The semi-arid tropics are characterized by unpredictable weather, limited and erratic rainfall and nutrient-poor soils and suffered from a host of agricultural constraints (Maqbool *et al.*, 2001; Sharma and Ortiz, 2000). Pursuing this further, Sharma *et al* (2002) highlighted that there is an urgent need to focus on improving crops relevant to the smallholder farmers and poor consumers in the developing countries of the semi-arid tropics. This can be through the development of crops that are adaptable to these environments.

That being the case Food and Agriculture Organization (FAO) and International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) (1996) agree that sorghum and millet have got the potential to contribute towards the food security of many of the world's poorest and most food-insecure agro-ecological zones. This can be achieved through increasing production and productivity of these crops in such agro ecological zones. These conclusions concur with those of Taylor (2003) that sorghum and millets have the potential to improve household food security in semi-arid regions because of their adaptability to such environments. Despite this, research on these crops has been lagging behind in Africa because they suffer something of an image problem and there often tends to be a preference for maize as the premier crop (Taylor, 2003).

DEFINITIONS OF FOOD SECURITY

According to Kidane *et al* (2005), food security is defined in different ways by international organizations and researchers. On the same note Maxwell (1996) pointed out that there are close to 200 definitions of food security. The 1996 World Food Summit defines food security as situation in which '…….all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life' (FAO, 1996).

Following this further, Maxwell (1996) echoed the views that the term food security is a flexible concept that should be given its explicit or implied definition whenever introduced. There are different definitions of food security and they have been refined over time: The World Bank report on "Poverty and Hunger in 1986 defined food security as "access of all people at all times to enough food for an active and healthy life". On the other hand FAO (2001) defined food security as a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.

However, earlier Maxwell and Frankenberger (1992) had commented that the many definitions of household food security, "all agree that the key defining characteristic of household food security is secure access at all times to sufficient food".

With most of Africa's economies being based on agriculture, Masomera (1998) observed that crop production forms the corner stone of household food security in Africa. In this regard, a household is considered food secured if it produces enough grain for its needs to last the whole year until the harvest of the next season.

Furthermore, FAO/ World Food Program (WFP) (2008) noted that food security of individual households in any given location would be influenced by an array of factors. These factors affect household access to food either through their own production or market purchases using cash income (or exchange) earned from agricultural or non-agricultural livelihoods. However, Kidane *et al* (2005) mention that, the current working definition of food security emphasize on availability, access, and utilization of food. In tandem with the literature, this study also investigates factors determining food security and this definition is adopted.

On the contrary, food insecurity is defined by FAO and Food Insecurity and Vulnerability Information and Mapping Systems (FAO/FIVIMS) (2008) as a situation that exists when people lack access to sufficient amounts of safe and nutritious food for normal growth and development and an active and healthy life. It may be caused by the unavailability of food, insufficient purchasing power inappropriate distribution or inadequate production at household level.

FOOD SECURITY SITUATION IN ZIMBABWE

In Zimbabwe, production of the main staple foods has been declining since the early 1990s greatly compromising household food security (Jayne *et al.*, 2006). Whilst various reasons have contributed to this, Rukuni *et al* (2006) pointed out that institutional and policy factors have played a major role in this decline.

FAO/WFP (2008) reported that household food security in Zimbabwe has declined due to drastic reduction in food and agricultural production following erratic rainfall and the gross lack of key farming inputs. These erratic rainfall and shortages of affordable inputs meant that poor "net consuming" households in Zimbabwe's semi-arid regions had difficulty in ensuring household food security (Chipika *et al*., 1999).

The Famine Early Warning Systems Network (FEWSNET, 2008) testified that food security in Zimbabwe continues to decline in the face of drought, acute foreign currency shortage and hyperinflation. FAO /WFP (2008) Crop and Food Supply assessment mission to Zimbabwe supported the same remarks and established that production decline in agriculture has been the main cause of household food insecurity in communal areas.

The worst affected provinces were those that lie in agro-ecological regions, IV and V that traditionally have a grain deficit, which are provinces of Masvingo and Matebeleland. The production capacity of farmers in these regions continues to decline as at times they are forced to liquidate their productive assets such as livestock (major source of draught power) in order to make ends meet (FEWSNET, 2008).

Findings by FAO (2008) suggests that for the agricultural season 2007/2008 there was an increase in area covered under the main staple maize but this did not correspond to increased

yield compared with the previous season. This was mainly because of the reasons outlined above. The situation meant that the number of people in need of food aid in Zimbabwe has increased as well as malnutrition amongst both children and adults (FAO, 2008). FAO (2008) further reveals that government, donor organizations such as Non Governmental Organizations (NGOs) and other charity organizations are expected to intensify their efforts to address the situation. The need is more urgent in those remote rural areas where farming is the only source of livelihood. The measures have to tackle the situation both in the short term and in the long run.

DIMENSIONS IN FOOD SECURITY

According to Mudimu (2003), the problem of food insecurity in Zimbabwe's rural areas has two dimensions. One dimension is the inability of the household to produce all its food requirements because of lack of access and diminishing quality of productive resources combined with an unfavourable or highly variable production environment. The other problem relates to the inability to acquire food from the market because of inadequate household incomes and or unreliable markets that deliver food at very high prices. Both of the above conditions point to the situation of access and availability of food and can create situations of transitory or chronic household food insecurity.

MEASURES TO MITIGATE ZIMBABWE'S FOOD SECURITY

Despite the deterioration in the food security situation in Zimbabwe the government of Zimbabwe has been issuing agricultural input aid (seed and fertilizer) to communal and resettled farmers as an agricultural recovery strategy (Foti *et al.*, 2007). Nonetheless, Foti *et al* (2007) suggest that not much benefit has been achieved from the government's subsidized input scheme especially in the semi-arid regions because input type and variety that was being issued did not tally with the agro-ecological location of the farmer. Issuing inputs to boost production of smallholder farmers, equipping them with improved crop management practices can assist in improving Zimbabwe's food security situation (FAO, 2008). In addition, FAO (2008) further supports the same notion that inputs need to suit farmer agro ecological region for better returns to be realized if Zimbabwe is to address its food security situation through increased agricultural production. FAO (2008) goes on to suggest that inputs of sorghum and millets should be distributed to low rainfall areas while inputs of maize should be distributed to high rainfall areas.

DIVERSIFICATION TO SMALL GRAINS

According to Rukuni *et al* (2006), in Zimbabwe food security is mainly based on maize and wheat (for bread). Small grains such as sorghum, *rapoko* (finger millet) and *mhunga* (pearl millet) play a minor role in household food security. In addition, Mudimu (2003) revealed that there has not been much diversification from maize as the dominant source of food in Zimbabwe. Even in drier areas where small grains can be produced economically and sustainably, maize is the mainstay of household food security (Rukuni *et al.,* 2006). Hence, production of sorghum and millets is seen as another crop diversification strategy that can alleviate food security in Zimbabwe's semi-arid regions (Rukuni *et al.,* 2006).

On the same note, lessons can be drawn from other countries on how sorghum and millet can enhance household food security in semi-arid areas.

SMALL GRAIN PRODUCTION CASE STUDIES

In two case studies that were drawn from India and Kenya it was shown that sorghum and millet can enhance household food security of marginalized rural farmers in semi-arid areas. In the Medak District of Andhra Pradesh in India, the poorest and most marginalized, members of the communities manage not only to achieve food security but also to assert food sovereignty, with sorghum and millet as the cornerstones of their strategy (Grains, 2007). These communities are marginalized in the sense that they are women and they practice their subsistence farming on the Deccan Plateau, which has one of the poorest soils and driest areas of India (Grains, 2007). However, they achieve household food security by growing millet and sorghum, which are ecologically compatible with their semi-arid areas. Hence, they achieve household food security and independence from government handouts.

In a study that was conducted in semi-arid eastern Kenya by Sutherland *et al* (1999) it was found out that household food security was more stable for those households growing more adaptable crops such as millet and sorghum. However, because of unreliable rainfall, food insecurity was high for those households that grew crops, which were less adaptable to the environment such as maize and beans.

Therefore, in Zimbabwe overall research can draw lessons from such case studies to build on the inherent drought tolerance of small grains such as sorghum and millet to ensure food security in drought prone areas (Alumira and Rusike, 2005).

GRAIN PRODUCTION TRENDS IN ZIMBABWE

In Zimbabwe grains such as maize, wheat and small grains (millets and sorghum) are most considered because they are the main staple food and contribute over 70 per cent of calorie requirements (Jayne *et al.*, 2006). Fig 2.1 below shows grain production trends in Zimbabwe from the period 1970-2003.

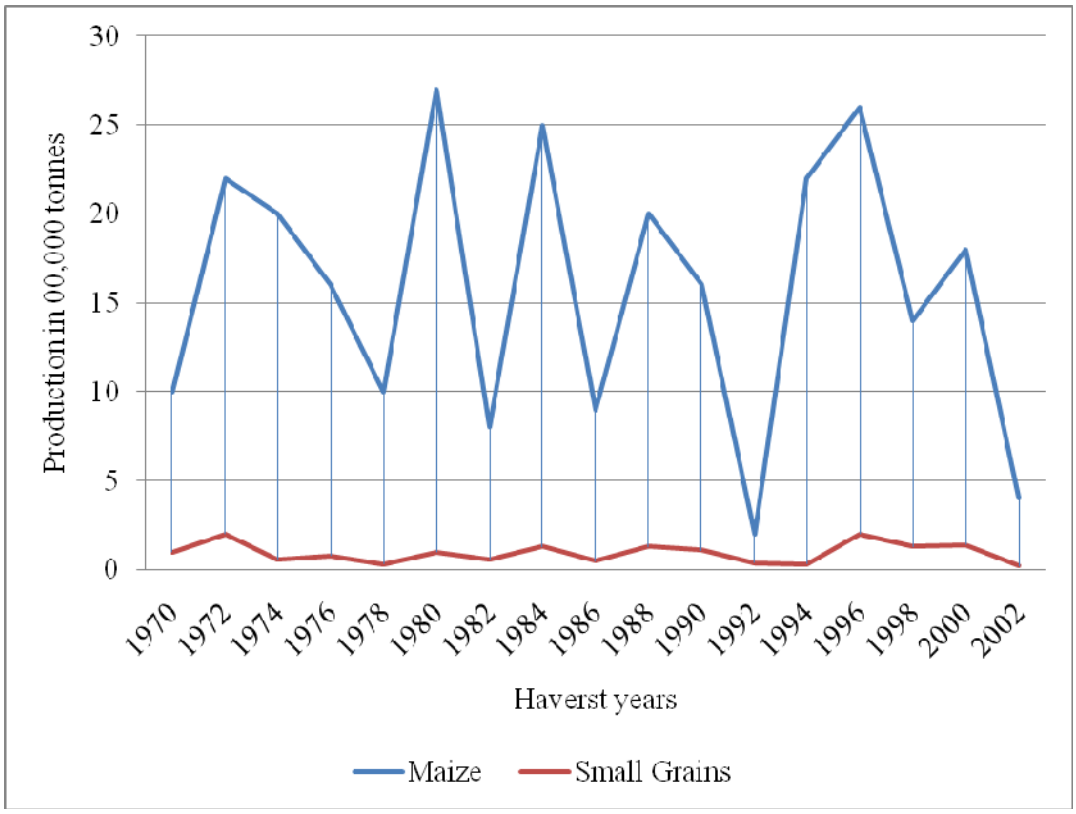

Figure 2.1: Grain Production Trends 1970-2003

Source: Jayne *et al* (2006)

Fig 2.1 shows that there have been major fluctuations in grain output in Zimbabwe from the period 1970 up to 2003. Seasons of high grain output coincide with years of optimal weather conditions whilst bad harvests are attributed to years of unfavourable weather conditions (Jayne *et al.*, 2006). From Fig 2.1 it can be shown that there were many more periods of

bumper harvests in the 1980s as compared to the 1990s. There has been drastic decline in maize production especially in the late 1990s. Maize production declined from close to 2.0 million tonnes in 2000 to almost 500,000 tonnes in 2002 (Jayne *et al.*, 2006). Fig 2.1 also shows that there have been major fluctuations in small grain production since the early 1970s up to 2002. These fluctuations have been pointing towards a declining trend. This decline can be attributed to problems by farmers in accessing seed, fertilizer and the reforms that happened in Zimbabwe's agricultural sector (Jayne *et al.*, 2006).

DECLINE IN SMALL GRAIN PRODUCTION

According to Rohrbach (1991), compared with maize, production of sorghum and millets has been declining in the Southern African Development Community (SADC) region. The situation in Zimbabwe has been such that for many years sorghum and millets have played a pivotal role in household food security (Leuschner and Manthe, 1996). Nevertheless, Eicher (1995) pointed out that Zimbabwe's Green revolution, which emerged in the early 1980's, saw maize outcompeting sorghum and millets as the major staples of rural communal farmers in semi-arid areas. This was because of the adoption of hybrid maize varieties that were suitable for these areas, access to credit, government support on maize prices and marketing subsidies.

However, this may be the case in Zimbabwe; three quarters of the communal households live in areas with less than 650 mm of rainfall per year (Rukuni *et al.*, 2006). This means that the larger part of the Zimbabwean population lives in natural regions IV and V. The need to review the competitiveness of sorghum and millets in Zimbabwe's semi-arid regions is now urgent. This is given the recurring droughts and the economic challenges that have left many rural households who rely mainly on maize production food insecure in these regions (Jayne *et al*., 2006).

IMPORTANCE OF SMALL GRAINS TO HOUSEHOLD FOOD SECURITY

According to Taylor (2003), sorghum and millet are vitally important cereals for the maintenance of food security in Africa. The same notion is supported by FAO (2008) that small grains are the answer to chronic food shortages to rural communities who reside in semi-arid regions especially of the sub Saharan region. This is because of their high levels of adaptation to African conditions (Taylor, 2003). They represent about half the total cereal production on the continent and as such are a major source of protein for the population.

Same conclusions were made in a study that was conducted by Alumira and Rusike (2005) which revealed that new sorghum and millet varieties can reduce the probability of zero yields. Thus, they can make a significant contribution to household food security in drought years (Alumira and Rusike, 2005). However, Alumira and Rusike (2005) argued that changes in varieties alone could not guarantee increased yields from sorghum and millet. Rather they have to be accompanied by improved crop management methods such as better soil fertility management.

Regardless of this, Taylor (2003) argues that sorghum and millets are still under researched compared to other cereals. In view of that, Taylor (2003) advocates that with proper research sorghum and millets could play a more important role and will offer better long-term food security than maize. This is because sorghum, pearl millet and finger millet are indigenous African cereals that, unlike maize and wheat, are well adapted to African semi-arid and sub-tropical agronomic conditions (Taylor 2003). Additional evidence is provided by Taylor (2003) that these grains represent the major source of dietary energy and protein for some one billion people in the semi-arid tropics. The same considerations were mentioned before by Rohrbach (1991) that sorghum and millet present potential food staples for many of the poorest farm households in semi-arid areas. Furthermore, their capacity to produce maize remains limited because of agronomic conditions. However, this is despite that in recent years these crops have been relegated to semi-subsistence status in favour of maize (FAO, 2008).

POTENTIAL OF SMALL GRAINS

There is enough evidence from literature to suggest that small grains can outperform maize in semi-arid areas both in terms of yield and drought tolerance. FAO (2006) suggests that although Zimbabwe's Natural Regions (NR) IV and V are considered inappropriate for dry land cropping, drought tolerant crops such as sorghum, pearl millet *(mhunga*) and finger millet (*rapoko*) are suitable crops that can be grown by smallholder farmers in these regions. Moreover, in the event of drought, maize can be destroyed yet drought tolerant small grain cereals such as sorghum and millet can yield some food for subsistence (Maphosa, 1994; Rukuni *et al*., 2006). Hence, it has been highlighted that small grains (sorghum and millet) have the potential to outperform maize in marginal areas if appropriate policy and

institutional support framework are designed to promote their production (Rukuni *et al*., 2006).

ADVANTAGES OF SMALL GRAINS

Van Oosterhout (1995) pointed out some advantages of small grains (sorghum and millets) over maize as:

- A smaller amount of flour is needed to cook the main meal compared to maize;
- A meal cooked from the small grains satisfies hunger for a longer period and gives more energy (which is especially important for persons who do heavy manual labour like farmers);
- The small grains store better (usually 3-5 years but up to 20 years were reported by some farmers) than maize which cannot be stored beyond eight months. Local cost free storage technologies are available whereas maize needs poisonous organophosphate protectants, often unaffordable by farmers;
- Seeds of several varieties of small grains are available for planting from the farmers own granary when needed and can be exchanged with neighbours and relatives - they might not need to be purchased;
- In years of low rainfall, small grains will give some yield especially when grown in a multicropped system, whereas maize will be a complete failure.

POLICY ON SMALL GRAIN PRODUCTION IN ZIMBABWE

In spite of past measures to stimulate rural food production and incomes, food insecurity remains highly prevalent in the low rainfall communal areas of Zimbabwe (Rohrbach, 1988; Jayne *et al* 2006). Evidence suggests that past increases in food grain production and marketing has been both concentrated in high rainfall regions and within these regions, most of the marketed surplus was produced by a small proportion of the households (Rohrbach, 1988; Alumira and Rusike, 2005). Yet, strategies adopted had tended to treat the smallholder farmers as a homogenous group especially in terms of input supply (FAO, 2008). According to Mudimu (2003), the government's approaches of incentives did not deal with the unique technological, socio-economic and agro ecological regions of the farmers of different resource endowment. Mudimu (2003) adds that there has been no clear policy promoting small grain production amongst smallholder farmers in Zimbabwe’s semi-arid areas where they are thought to have a comparative advantage over maize particularly regarding their

research. The same views were upheld before by Leushner and Manthe (1996) that production of small grains has been on the decline in Zimbabwe due to policies that favor production of maize.

In contrast, Sukume *et al* (2000) is of a different opinion that for decades policy makers have encouraged the production of sorghum and millets in Zimbabwe. This was in the belief that they will reduce food shortages in communal areas, which lie in natural regions IV and V. Furthermore Sukume *et al* (2000) adds that policy makers thought that these crops would subsequently out compete maize in these semi-arid regions. Nevertheless, it has been shown that maize, particularly the short season varieties, has out yielded small grains in these regions (Sukume *et al.,* 2000). Mazvimavi (1997) attributes this higher yield to more research efforts being channeled into maize than to small grains.

CHALLENGES IN PRODUCTION OF SORGHUM AND MILLETS

According to Sukume *et al* (2000), production of maize continues to dominate in Zimbabwe's semi-arid regions compared to small grains sorghum and millet because it offers higher yields. Sukume *et al* (2000) further noted that low yields of small grains have acted as a major obstacle and challenge for communal farmers in Zimbabwe's semi-arid regions to expand and adopt production of small grains on a large scale compared to maize. This lower productivity causes small grains to be very unattractive to communal farmers in the semi-arid regions was also cited by FAO (1995).

In the same way, Macgarry (1990) pointed out some of the challenges that communal farmers' face in sorghum and millet production and why they end up preferring maize. One of these major challenges is:

- Depredations of the quelea birds on sorghum and millet than does maize

Following this further, research has shown that rising labour costs in small grain production have affected most farm operations, from land preparation, weeding, bird scaring to harvesting and grain processing (FAO, 1996). In addition, the ease with which maize can be processed compared to the traditional staples of sorghum and millet is the other main reason why maize became widely accepted even in Zimbabwe's semi-arid regions during the green revolution (Alumira and Rusike, 2005).

Sukume *et al* (2000) have explained lack of processing technologies as yet another factor that has hindered the development of alternative formal markets for sorghum and millet. By using traditional processing technologies, sorghum takes longer to process than maize especially during harvesting (Sukume *et al.,* 2000). This factor has reduced its demand by even the poorest of the poor communal households (Mazvimavi, 1997).

Alumira and Rusike (2005) expand more on the challenges that even under semi-arid conditions it might be very difficult for small grains to compete with maize. This is because sorghum and millet do not yield much crop residue, which plays a very important role to communal farmers in terms of animal feed and crop manure. Similar observations were noted by Mapfumo *et al* (2005) that livestock depend upon crop residues for survival during winter, mainly from maize stoves.

Another very important factor, which has been acting as a production constraint towards sorghum and millet production, is changing food preferences. FAO (1996) explains that as incomes rise, consumers tend to purchase wheat, rice and in some cases maize, rather than traditional coarse grains. As a result, communal farmers tend to view sorghum and millet production as having lower returns than other enterprises. Real producer prices for sorghum, millets and edible legumes dropped considerably, since the trade liberalization program, compared to that of cash crops and maize (Macgarry, 1994). This also has acted as a major reason why rural farmers have shunned small grain production in favour of maize.

GOVERNMENT ROLE IN PROMOTING SMALL GRAIN PRODUCTION

Evidence of the role of government in promoting production of sorghum and millet can be drawn from West African countries. Mallet and Plessis (2001) noted that there had been an increased production of sorghum and millet in this part of the continent by communal farmers since the last great drought in that region of 1982-85. This was because of cereal market liberalization jointly initiated in 1986 by Sahalian countries and the support measures given by the government and donor countries (Mallet and Plessis, 2001).

Consequently, similar policies were observed in Zimbabwe during the green revolution on maize in the 1980s. The Green Revolution came about because of government policies that supported development and dissemination of improved varieties, efforts to promote fertilizer

use, and greater extension designed to improve crop management (Eicher, 1995). In the same way, Alumira and Rusike (2005) suggest that if government policies are crafted in Zimbabwe that support the production of sorghum and millet at the same level as maize then an increased production in these crops can be achieved in semi-arid areas.

Similar findings were highlighted by Rukuni *et al* (2006) that lack of government support in Zimbabwe for production, processing and use of crops that are tolerant to drought has resulted in people in the drier areas changing their tastes from millet and sorghum to maize.

However, FAO (1995) argued that for sorghum and millet to vie with maize in the limited resources of the communal farmers, there is need for them to outperform maize in terms of yields. This entails massive investment by government and the private sector in the development of hybrid sorghum and millet varieties that have higher yields and better taste than maize (FAO, 1995).

MARKET DEVELOPMENT FOR SORGHUM AND MILLET

In Zimbabwe, the need for cash by rural farming families has been such that crops that are suitable for agro-ecological regions have often been overridden for maize production (van Oosterhout, 1995). In these regions, maize has a ready market and can be easily traded to meet other financial obligations.

In that regard, Rohrbach (1991) pointed out that government needs to come up with policies that favour the development of competitive intra rural markets if smallholder farmers are to be encouraged to grow sorghum and millet. Development of rural markets for sorghum and millet would act as a great incentive for rural farmers in these semi-arid regions to grow these crops. This is because they will now be growing them for both subsistence household food security as well as cash crops to meet other financial demands.

Following this further FAO (1995) reported that Zimbabwe's formal market handle less than 10 per cent of total sorghum and millet production. In addition, FAO (1995) also noted that most of the sorghum and millets produced in Zimbabwe is consumed by the producing households, or sold in the informal markets, mainly for traditional beer brewing.

However, in Zimbabwe the price of maize in the informal markets is cheaper than that of sorghum and millets (FAO, 1995). Hence, in terms of market potential there is good reason to expand production of sorghum and millets in Zimbabwe's rural areas in view of the price differences.

ECONOMIC GROWTH

Taylor *et al* (2006) explain that commercial processing of sorghum and millet into value-added products in developing countries has the potential to stimulate economic development in these countries. Therefore, policies that support increased production of sorghum and millet should be viewed in a holistic approach regarding contributions they can make to the macro economy and not only as a means of increasing food security to those in semi-arid areas.

In Zimbabwe, it has been deduced that the industrial and commercial use of sorghum and all small grains in general are very limited (Sukume *et al.,* 2000). That being the case, Rohrbach (1991) mentions that gains to the economy from increased industrial use of small grains will have ripple effects besides just improving rural food security. These include but are not limited to reducing the need for drought relief, lowering the level of subsidies underlying grain markets, and, at least in the short run, stemming migration from rural to urban areas.

CONCLUSION

From the literature review, it has been shown that sorghum and millet have the potential to enhance household food security in semi-arid areas. This is because they are better adapted to these environments compared to maize. However, this is regardless of the challenges that they offer to farmers in producing them. Nevertheless, many authorities seem to reach a consensus that not much is being done to tap into the potential of these crops. This is in terms of government support to promote research on sorghum and millet in Africa. In Zimbabwe, it has been noted that small grains have received little government support to promote their production in semi-arid regions compared to maize. Though this may be, lessons of improving household food security through increased small grain production can be drawn from the Sahalian region. Finally, it has been revealed that policies promoting small grain production should be viewed beyond just enhancing household food security. Rather other benefits that accrue to the macro economy at large should also be incorporated.

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