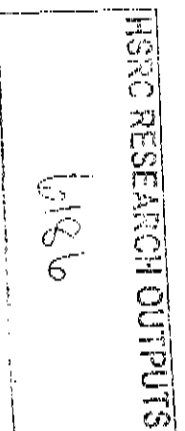# Boosting smallholder production for food security: some approaches and evidence from studies in sub-Saharan Africa

I Matshe[1]

Abstract

This paper uses the sustainable livelihoods framework to explore the contribution of smallholder production to food security in some sub-Saharan African countries and relates it to the South African case. Noting that many of the world's hungry are smallholder farmers, it is clear that food insecurity is closely linked to the livelihood strategies of these farm households. As previous studies have shown, food insecurity is linked to livelihood assets, strong institutional support and a favourable external environment. In particular, the paper finds that food security depends on cereal output, budgetary support to agriculture, agricultural value added and poverty – all variables strongly linked to the sustainable livelihoods framework. Since most poor rural households rely on agricultural production for a significant share of their household income, increasing agricultural productivity is critical to increase food security and reduce rural poverty.

Keywords: Food security; livelihoods; smallholder agriculture; sub-Saharan Africa

1. Introduction

In recent years, several countries in sub-Saharan Africa have emphasised the importance of employment in rural areas as a way of reducing rural poverty and food insecurity. This has taken the form of establishing schemes to identify strategic priorities and channel financial resources to rural development. In essence the primary motive is to solve the immediate problem of hunger through smallholder production of food and the generation of sufficient income to enable rural populations to buy enough food (Dorward et al., 2004). This contrasts with past policies where agriculture was seen to be the only employment sector in rural areas.

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Today's rural areas have changed and offer different business opportunities, not only in agriculture, but also in service sectors such as retail, mass and small-scale tourism, and in aquaculture. However, many countries still regard agricultural self-employment in rural areas as the key element of rural development. Since most of the production in rural areas is conducted by farming households, the belief is that production plays an important role in rural livelihood strategies. How significant that role is or could be is not altogether clear, but this paper aims to explore the evidence about the conditions under which own production has contributed to food security in some Sub-Saharan African countries and draw inferences about how South Africa can boost smallholder own production in order to reduce food insecurity.

Further, agricultural growth that fosters improvements in productivity on small farms has proven to be highly effective in reducing poverty and hunger and raising rural living standards, as demonstrated in large parts of Asia during the Green Revolution (Rosegrant & Hazell, 2000). Evidence from across Southern Africa indicates that several efforts have been made towards resourcing rural areas, where most smallholder farmers were the main beneficiaries. The aim was to increase production and employment by providing subsidised inputs and developing production-related infrastructure and institutional service provision (Stanning, 1989; Poulton et al., 2006a; Rukuni et al., 2006; World Bank, 2008). Unfortunately, this has resulted in little real progress in agricultural employment and food security. Using the sustainable livelihoods framework the author seeks to find out why this has been the case and use the variables suggested to found out whether there is a relationship between them and the proportion of people undernourished in 38 countries from Sub-Saharan Africa.[2]

Although actual policies employed differ slightly across the sub-region, most of the interventions were tailored primarily towards providing policy support with increased extension services, subsidised inputs, increased access to markets and farmer training, including demonstrations, for increased output. In Senegal, Zambia, Kenya and Uganda in the decade

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[2] The data used is for the following countries: Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Congo, Côte d'Ivoire, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritius, Mozambique, Namibia, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia, Zimbabwe.

1980-1990, government policy efforts were focused primarily on production infrastructure, although intervention was curtailed by public finance cutbacks in the name of macro-economic stabilisation (Fan *et al.*, 2003; Poulton *et al.*, 2006b). Productivity (in terms of relative output growth) fell by between 4% and 13%. However, some countries in the region have had better success by directing support almost exclusively to smallholder farmers (e.g. Zimbabwe in the 1980s and Malawi in the early 2000s).

In order to examine the contribution of own production to food security, this article begins by considering who the hungry are, before considering the conceptual framework of the study and context of smallholder livelihood performance (Section 3). Section 3 goes on to explore major elements of the framework - natural capital, human capital, and institutional support to smallholders - as they apply to boosting food production. In Section 4 a simple regression equation is applied to find out if there is a relationship between some of the identified variables (or their proxies) and food insecurity. The article concludes by drawing out the implications of the findings for South Africa.

2. Smallholder agricultural producers and hunger

Most of the world's hungry live in rural areas, and depend on the consumption and sale of natural products for both their income and food. 50% of the world's hungry are smallholder farmers, 20% are landless rural, 20% are pastoralists, fishers and forest dependent and 20% are the urban poor (FAO, 2008). The largest proportion of the hungry is concentrated among the world's landless, or smallholder farmers whose plots are too small to provide for their needs. However, hunger is also a growing problem in the fast-growing poor urban spaces as well, which are now home to more than 40% of urban inhabitants in developing countries.[3]

In sub-Saharan Africa and Southern Asia, the proportion of undernourished people has decreased in the last two decades, but the numbers of hungry people have been rising (FAO, 2004). In absolute terms, the number of undernourished people in the developing world fell by just nine million over this period. This suggests that smallholder

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[3] *Note that not all of the poor urban spaces are fast-growing. Developing countries generally have pockets of fast growing areas and areas that are stagnant or deteriorating.*

farmers are central to efforts to tackle food insecurity in the developing world. In sub Saharan Africa, landless rural dwellers are also a critical target group. In general, these two groups are characterised by a low level of livelihood assets (Ellis & Freeman, 2004).

3. The sustainable livelihoods framework, poverty and food insecurity

Juxtaposing the farming systems and livelihood strategies of poor farmers against those of their wealthier counterparts often raises more questions about rationality of these producers. The initial step to developing a better understanding of the structural predicaments sustaining poverty and food insecurity in African villages begins by understanding the premise of their livelihood strategies. When the root causes and behavioural manifestations of poverty and household food insecurity are not understood, then policy interventions are likely to be ill-informed and unlikely to succeed in moving the poor out of poverty and food insecurity (Mano, 2006). To influence changes in the poverty outcome for smallholder farmers one needs to take into account a framework that considers the relationship between internal and external influences on the households to their livelihood outcomes. The sustainable livelihoods framework (Figure 2) is one such approach.
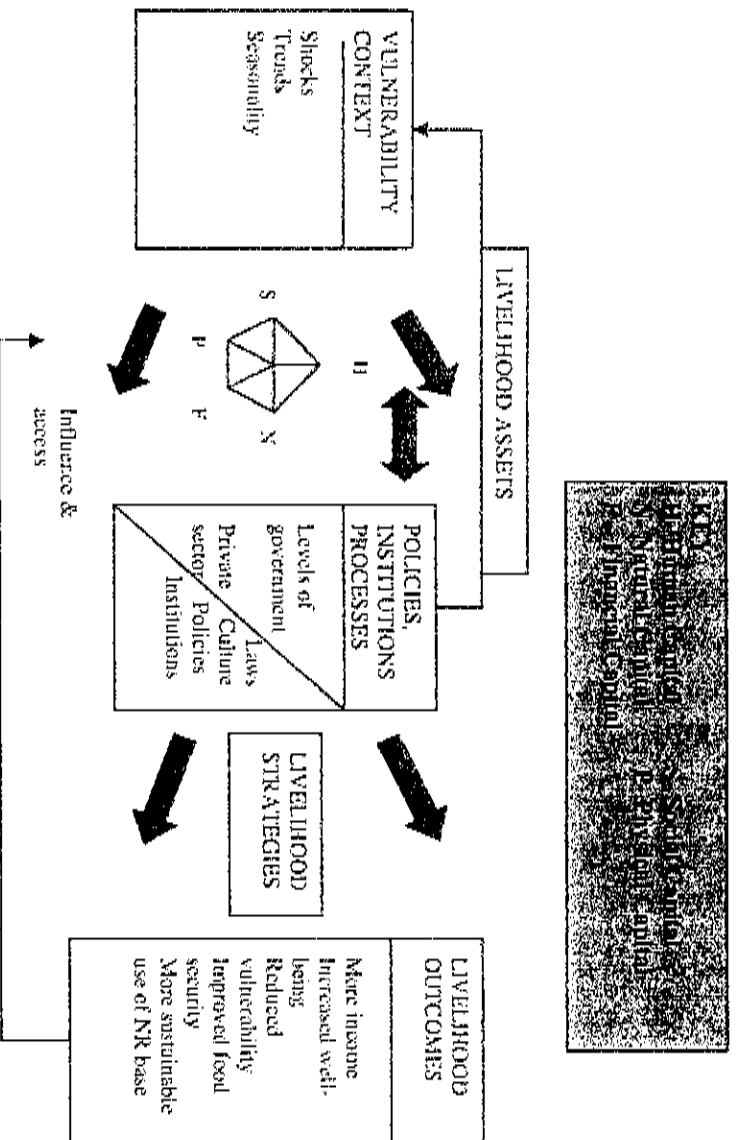
Figure 1: Sustainable livelihoods framework
Source: DFID & FAO (2000)

The sustainable livelihoods approach recognises that households need to possess assets essential to their livelihood strategies: human capital, natural capital, financial capital, social capital and physical capital. Households adjust to their physical, social, economic and political environments by using these assets, through a set of livelihood strategies designed to strengthen their wellbeing (Timmer, 2003; Bryceson, 2005). Households are only viewed as being sustainable if they can adjust to threats without compromising their future ability to survive shocks to their livelihoods. This framework suggests that adequate ownership of livelihood capital assets is essential for pursuing a range of livelihood opportunities, and is a key determinant of livelihood performance and ability to accumulate assets for optimal production and for consumption smoothing in the face of seasonal climatic and market risks. Reducing asset poverty is the key to enhancing food security and livelihoods for poor and vulnerable rural agricultural populations. All transformation of structures and processes, though influential, plays a second-tier role in shaping

livelihood strategies in order to attain higher livelihood outcomes (DFID & FAO, 2000; Dorward & Kydd, 2004).

This article considers evidence from studies in sub-Saharan Africa through the prism of the sustainable livelihoods framework - i.e. physical capital, human capital, and financial capital as they relate to policies, institutions and processes. This is used to identify the determinants of food insecurity in sub-Saharan Africa in order to draw inferences and implications for the South Africa case.

3.1 Natural capital

Access to, and use of, natural and physical capital varies considerably both within and among countries (FAO, 2004). Small landholders consistently employ practices that are less capital-intensive than other producers are in favour of using their most abundant resource - their own labour. Human capital is strongly related to the level of wealth - heads of poorer households are generally less educated than those of richer households. A third element, the environment (or climate) is increasingly being put forward as one of the most important drivers of food insecurity in the sub-Saharan region. For sub-Saharan Africa, overall output per worker in agriculture was $486 in 2005 and $243 in 2003, barely over a $1/day (FAO, 2007). By contrast, the output per worker in non-agriculture was $3 770. This strongly suggests that poverty and food insecurity in the region is, at least in a proximate sense, related to low productivity in agriculture. Despite this, it seems that household production continues to be an important livelihood strategy in the region.

According to households, determinants of food security go beyond climate and the environment, or land and tenure security. In a review of several studies of household food security in southern Africa, Misselhorn (2005) isolated 33 drivers identified by householders as being critical determinants of food security. The mix of drivers varied across the region, but households in all communities indicated that many interacting factors resulted in vulnerability to food insecurity. Using the lens of the 33 drivers, Misselhorn inspected 555 literature citations and determined the top seven factors (Table 1). Table 1 shows climate/environment to be the most

commonly cited driver of food insecurity, and poverty,[4] property rights, human capital, market access and unemployment being the next most significant factors.

Clearly, agricultural capital and levels of poverty are determinants of food security. What this means is that, in sub-Saharan Africa, a person who is poor is probably also food-insecure. It does not establish whether being poor causes food insecurity, or vice versa.

Table 1: Key drivers of food insecurity identified by rural smallholders

Drivers that primarily reduced food production	Percentage among 555 literature citations	Drivers that primarily restricted access to food	Percentage among 555 literature citations
Failures in property rights	5	Poverty	7
Climate/environment	12	Market access	4
		Food price increases	5
		Lack of education	5
		Unemployment	5

Source: Scholes and Biggs (2004)

The fact that unemployment is amongst the most mentioned drivers of food insecurity suggests that there is a significant non-farm set of livelihood strategies in Southern Africa. What is not clear is whether the term 'unemployment' in these studies refers to unemployment in its widest sense, or to agricultural unemployment. For this reason, the regression analysis below does not include unemployment as an independent variable.

In another study, Ziervogel et al. (2005) compared the determinants of food insecurity from four case studies: Mangondi village in Limpopo, South Africa; Greigikh rural council in North Kordofan, Sudan; Chingowa village in Borno State, Nigeria; and Tlaxcala State, Mexico. They found that, since each of the study sites is in a dry, drought-prone climate, declining precipitation is a source of major concern for household food security. However, they also found that household characteristics related to resource access play a dominant role in determining household food security. These include household income, income diversification, area of

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[4] In was not consistently clear in the set of studies that the definition of poverty did not include asset poverty.

land cultivated, soil quality, household labour per hectare cultivated, and health status of household members. In addition there are also factors external to the household that play a role. These include existence of formal and informal social networks, availability and quality of health services, and prices of farm inputs and outputs.

The foregoing implies that the set of problems that are faced by the rural poor in increasing production are diverse, with a potentially diverse set of solutions. From a sustainable livelihoods perspective this indicates that capital assets mostly of a natural type (for example, land) or a physical type (for example, infrastructure), are at the root of attempts to enable farmers to successfully produce for themselves. However, these have to be complemented by policies, processes and institutions to enable the attainment of particular livelihood outcomes (Mano, 2006).

Table 2 is a comparison of the proportion of undernourished people and per capita agricultural gross domestic product (GDP) of selected countries in 1991 and 2003. The table shows that the variables (particularly per capita agricultural GDP) that are correlated with a decrease in the proportion of the undernourished varied across a selection of 10 countries. In most countries that had a combination of good economic growth performance and a significant rise in per capita agricultural GDP, a positive effect on the prevalence of the undernourished was observed. However, this does not imply a strictly causal relationship between these factors. Researchers are yet to establish definitive causality in the links between agricultural growth and general economic growth using country data (Gardner & Tsakok, 2007).

Table 2: Prevalence of undernourished people as a percentage of the total population and per capita gross domestic product in selected sub-Saharan countries

Country	Per capita agricultural GDP of the agricultural population (US$ constant 2000 prices)		Per capita GDP (US$ constant 2000 prices)		Proportion of undernourished in total population (%)	
	1989-1991	2003	1989 -1991	2003	1989-1991	2003
Cote d'Ivoire	239	330	668	615	18	14
Ghana	148	175	215	273	37	12
Kenya	87	78	372	341	39	31
Malawi	41	70	134	147	50	34
Mozambique	63	80	161	254	66	45
Senegal	119	119	421	492	23	23
Uganda	91	112	177	271	26	19
Zambia	81	88	370	341	48	47
Zimbabwe	117	178	587	604	45	45

Source: FAO, 2007

It is important that in some countries though a fall in the prevalence of under-nourishment did not translate into a reduction in the number of the malnourished (not included in Table 2), but even there, there was an increase in the average dietary energy supply, expressed as kilocalories per capita per day, and indeed there were increases in Uganda, for example, from 4.2 million to 4.6 million people.

Table 3: Number of undernourished people and cereal production in selected countries

Country	Cereals (*thousand tonnes*)		Number of people undernourished (*millions*)	
	1989-1991	2003	1989-1991	2003
Cote d'Ivoire	1225	1808	2.3	2.2
Ghana	1155	2041	5.8	2.4
Kenya	2958	3351	9.5	9.7
Malawi	1560	2142	4.8	4.0
Mozambique	629	1813	9.2	8.3
Senegal	996	1452	1.8	2.2
Uganda	1597	2413	4.2	4.6
Zambia	1467	1365	4.0	5.1
Zimbabwe	2393	1259	4.8	5.7

Source: FAO, 2007

Most countries in this bracket achieved this through increases in food imports and or food aid. Increases in food imports and or food aid resulted in an expansion of total food supply. The result would, however, be that

domestic linkage effects of agriculture are minimal. Since the food deficit was covered from external (to the domestic economy), increases in food supply does not lead to increases in rural incomes that could be generated from domestic production linkages. This suggests that, in cases like these, economic growth might not include output expansion by smallholder farmers.

In other studies, productivity increases have been shown to have a strong positive impact on the rural economy, leading to increased food availability at the household level (FAO, 2004). In addition, the increased incomes of smallholders provide stimulus to rural economic activity by generating increased demand. In Malawi rural economic activity increased substantially following an increase in food production and the livelihoods of households in the areas affected improved, opening avenues for smallholders to strengthen their livelihood assets (Dorward & Kydd, 2004). Haggblade *et al.* (1989) and Delgado *et al.* (1998) illustrate how the linkages between agriculture and the local economy can take many forms depending on the particular circumstances of the farmers and the livelihood assets they hold and or have access to. Usually consumption linkages are particularly significant but other indirect linkages between sectors mediated via investments, infrastructure and skills are also important. Using data from several sources Delgado *et al.* (1998) estimated agricultural sector multipliers for Senegal (1989-1990) and for Zambia (1985-1986) of 1.31 to 4.625, although they found the average for the continent to be closer to 1.4. The important point is that rural poverty reduction depends on rising yields in agriculture, creating growth linkages in rural non-farm sectors.

However for some parts of Africa including South Africa, some authors (Bryceson, 2003; Dorward & Kydd, 2004; Ellis & Freeman, 2004) have suggested that this market link might be weak resulting in smallholder agricultural producers engaging in more than one livelihood production activity. In this sense using more than one livelihood strategy can be represented as a result of failure of agriculture to provide a sufficient livelihood for a substantial proportion of rural dwellers (Bryceson & Bank, 2001; Bryceson, 2002). This view holds that a process of 'deagrarianisation' is occurring whereby farming is becoming a part-time, residual activity and livelihoods are becoming increasingly oriented towards non-farm and non-rural activities. Research in Tanzania, Malawi, Kenya and Uganda

(Ellis & Mdoe, 2003; Ellis *et al.*, 2003; Ellis & Freeman, 2004) and in Zimbabwe (Zikhali, 2009) shows that amongst other things the poorest and most vulnerable are the ones most heavily reliant on agriculture, but they hold less than 0.5 hectares of land, are most strongly locked into subsistence within agriculture and struggle to generate substantial cash from non-farm sources. These would typically represent households with very low livelihood assets including low human and social capital.

However, engagement in market exchange and livelihood diversification could show a 'virtuous' and cumulative spiral upwards.[5] In this way, smallholders with low levels of livelihood assets could steadily be propelled towards more mainstream market exchange as assets can serve as collateral, households with sufficient assets can exploit investment, and agricultural expansion opportunities can more effectively generate cash income. It is thus important for policy makers to be clear what type of livelihood diversification is being observed and hence to design policies that address cash constraints for further development where appropriate. This paper limits its attention to a single variable – capital stock. Although capital stock is difficult to measure, it is an important component of identifying interventions aimed at supporting livelihoods diversification. The definition should be as wide as possible, acknowledging that some items may be seen as capital stock from one point of view, but not from another. For example, livestock is capital of a kind, but it may also have a less tangible significance that goes beyond seeing livestock as mere capital.

3.2   Land, food security and employment

The Integrated Food Security Strategy of the South African government and the land reform policy of the Zimbabwean and Namibian governments highlight land, among other things, as an important factor in food security (Moyo, 2006). This is because there cannot be enough smallholder production and household food security if households do not have access to land of enough quantity and quality to make a difference in either the quantity produced or the amount of income generated from the output. Such people can – in principle – significantly reduce their

[5] Note that although livelihoods diversification is a contested phenomenon, we use it here to explore the range of strategies open to households without necessarily implying whether or not it indicates a positive or negative tendency or as a phase neither transitory or permanent since it is our contention that diversification could be a permanent (and sustainable) strategy for these households.

vulnerability to food insecurity if they were to have access to land for smallholder production and sales. Many rural smallholders in this region therefore depend very much on wage or non-farm employment. In other words, employment is important in most rural areas, but as farm jobs have continued to dwindle – driven partly by land reform – and poverty spreads and deepens, vulnerability to food insecurity also increases.

As part of a study to monitor the quality of life of land reform beneficiaries in South Africa, May and Rohr (2000) concluded that land reform could potentially reduce the poverty rates in rural areas by 1%. This figure, though it seems to be very small, does indicate that land reform can reduce poverty and lower vulnerability to food insecurity in South Africa. The larger the size of the available land and the smaller the number of beneficiaries, the higher the farm income per household and the lower the vulnerability to food insecurity provided the beneficiaries are not encumbered by debt. Mlambo (2000) also finds that rural households with a sizeable amount of land are better off (in terms of personal welfare) and are less likely to be poor and food-insecure than those with marginal lands or without land.

Most of the above studies only considered agricultural production when estimating household incomes derived from land. Land can be and has been used in various parts of the world, and in South Africa, to create other rural livelihoods. These livelihoods include the collection of natural resources such as fuel wood, edible herbs and fruits, aquaculture, game-meat, medicines and other items, either for direct consumption or for sale (Shackleton & Shackleton, 1999). This is critical for food security in rural areas and in some urban areas as well (Jacobs & Xaba, 2008). International experience also shows the importance of access to land and land reform in alleviating poverty and hence food insecurity.

Evidence from further afield also indicates the importance of access to land. The result of reforming landholding and access in China was a reduction in income-based absolute poverty to an average of approximately 6 to 11% from 1979 to 1981 (El-Ghonemy, 1990). There was also a sustained reduction in the number of the poor, from about 240 million to about 50 to 80 million, over the same period. Furthermore, the agricultural growth rate, crop yields and per capita food grain production rose substantially. South Korea also experienced considerable

improvement in livelihoods after land reform. The South Korean land reform programme resulted in 60% increase of the total cultivated land area and a dramatic improvement in equal access to land – the Gini coefficient with respect to land went from 0.729 to 0.384 between 1945 and 1965.6 The rate of growth of agricultural output was impressive by international standards. The average annual rate of food production increased by 4%. Average farm income per household also increased by 51.4% between 1963 and 1975, and the Gini coefficient in income in rural areas was at the very low level of 0.298. Poverty reduced at a rate of 20% per decade between 1945 and 1950, and at 10% per decade from 1965 to 1978 (El-Ghonemy, 1990).

It is important to also note that land reform programmes in Latin America and Africa have produced mixed results in terms of their impacts on poverty and food security. This can be attributed to the fact that most of the land reform programmes in Latin America and Africa have been partial reforms, in the sense that land redistribution was the main focus and not much support was given to beneficiaries of these programmes. This is in contrast to most land reform programmes in East Asia, where additional support was an important part of each programme. In addition, most land reform programmes in Latin America and Africa adopted collective production methods for beneficiaries rather than focusing on individual farmers. These differences are important in understanding the effect of land reform in different parts of the world, as they interact with other internal and external production and market conditions. In the same breath it should be noted that there are large costs when land reform fails, and this should be taken into consideration when planning and executing such programmes. Support for delivered livelihood assets could be more important in capacitating smallholder farmers than the mere delivery of the asset (Chinhowu, 2004). Evidence from Zimbabwe shows that provision of land on its own cannot enable smallholders to formulate agricultural production livelihood strategies to achieve a food secure status. As mentioned in above and particularly pertinent to research evidence from Zimbabwe, monetisation of the agricultural economy is crucial to the vulnerability status of rural populations. Availability of cash in circulation in rural areas gives individuals broader alternatives to construct diverse livelihoods that help to reduce vulnerability. Of course,

5 *Where I would represent complete inequality (all the land in the hands of one person) and 0 complete equality (every person has the same amount of land as every other person).*

in most countries in Africa budgetary constraints and macro-economic stabilisation tended to curtail the ability of the state to support these farmers.

3.3   Policy and institutional support

As the previous section suggests, food insecurity is closely linked to poverty and poor agricultural performance in rural areas. Therefore intervention that increases own production can go a long way towards addressing food insecurity, not only by enabling people to grow the food itself, but also by providing the means through which such food can be acquired. However, the results of policy interventions have been mixed.

In Zimbabwe between 1980 and 1986, staple maize output more than doubled compared to the previous decade, on the back of favourable commodity prices coupled with improved infrastructure and institutional services. Land area planted with maize rose substantially, and the amount of marketed maize produced by small-scale farmers represented 47% of total national maize output in 1986 and had risen to 90% by 1989 (Stanning, 1989). Marketed output of finger millet rose from 386 tonnes in 1983/1984 to 12 500 tonnes in 1985/1986. The production by small producers of cash crops (which provides the means by which livelihoods can be enhanced) also increased after agriculture policy was refocused towards these farmers. Cotton production (important for its cash-generating possibilities) rose from 160 000 tonnes in 1980 to 350 000 tonnes in 1990. After a decade of pro-smallholder policy support, by 1991 smallholder farmers contributed more than 50% of national maize production, more than 60% of cotton, 99% of sunflowers and most of the small grains and groundnuts that were formally marketed (Mudimu, 1992; Eicher, 1995; Rohrbach, 1988).[7] Such was the success of the interventions in the 1980s that this period is referred to as Zimbabwe's smallholder revolution (Rukuni & Eicher, 1994) and is attributed mainly to the linkage between technology, service organisations and institutions (or parts thereof) developed specifically to deliver on the policies adopted to advance smallholder agricultural development. Similar success at a smaller scale was recorded by coffee and maize farmers in Malawi (Chirwa et al., 2007).

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[7] Note, though, that these increases levelled off and in fact were reversed in the 1990s, when poor macro-economic management and political crisis led to the withdrawal of subsidy inputs.

Research in Zambia and some from Uganda and Kenya show that government policy was mainly directed at providing smallholder producers with relatively easy market access, without necessarily giving direct support that explicitly targeted smallholder production (supply-side) (Bezuneh *et al.*, 1998). As in the Zimbabwean case, subsidies for inputs were generally used to enable these producers to afford fertilisers and seeds during the pre-structural reform period. However, this, did not substantially improve food security in these countries for several reasons, including the existence of large, deeply embedded socio-economic inequalities, poor access to quality land by the majority of households, lack of appropriate technology for an ever-changing production environment, lack of adequate institutional and infrastructural support, and poor support services. As a result, the labour participation rates in rural agricultural production were very low. The percentage of household labour that spent more than 50% of their labour time on agricultural production kept falling, and household and individual food insecurity worsened (Obwona, 2002).

In analysing the successes and failures of supply-side, state-led policies and demand-side market liberalisation in sub-Saharan Africa, Dorward *et al.* (2004) found that some of the major issues that held back progress in these countries included problems related to public goods, complementary co-ordination of policy, and market development. They describe a common pattern of government policy in successful green revolutions in terms of two active policy phases. The first phase establishes the basics, with investments in public goods to develop technologies that will raise small farms' potential productivity. During this time, it might well be that extensive production and other non-efficient types of production could be pursued. Therefore, agricultural output or per capita agricultural gross domestic product (AgGDP) is directly related to food security in these countries. The second phase kick-starts markets, with carefully co-ordinated complementary investments to improve small farmers' access to the financial services and input and output markets necessary for technology adoption. This reiterates the important role of not only sequencing and effectiveness, but also complementary investment and market development in enhancing rural agricultural development. Unfortunately, in most sub-Saharan African countries this complementary sequencing has been poor; therefore most intervention has not actually improved food security in these countries (Rukuni & Eicher, 1994).

To sustain food security, availability, access to and utilisation of food have to be secured (Mellor, 1984). Clearly, then, the challenges of making a positive impact on food availability (i.e. supply-side) are firmly rooted in the ability of rural-dwellers to access production inputs and land. Following a decade of declining productivity, in 2005 the Malawi government instituted a national scheme to subsidise improved seed and fertiliser. The results indicate the strong feasibility of investing in food crops grown by smallholder farmers as an initial step towards sustained economic growth in rural areas. As Table 4 shows, output increased. For the first time, Malawi exported 300 000 metric tonnes of maize grain to Zimbabwe in 2007.

Table 4:   Malawi maize output 2003-2008

Output	2003	2004	2005	2006	2007	2008
Production (million metric tonnes)	1.98	1.61	1.23	2.58	3.44	2.78
5 year average (2001 – 2005) (million metric tonnes)	1.62	1.62	1.62	1.62	1.62	1.62
% above average	22	-1	-24	59	112	73

Source: FAO (2009)

The number of Malawians at risk of hunger decreased to about 500 000 in late 2007 from 5 million in 2005.

The experiences of Zimbabwe (in the 1980s) and Malawi show that with increased direct state intervention in providing assistance to smallholders, rural areas teeming with unemployed and underemployed people could substantially increase the volume and quality of production and restructure rural economies. However, providing this support has a cost and most Southern African Development Community (SADC) countries are failing to reach the 10% budgetary annual expenditure allocation for agriculture agreed in the 2003 Maputo Declaration on Agriculture and Food Security in Africa of the African Union (see Table 5), citing budgetary constraints.[8] Be that as it may, evidence from Malawi in particular shows a strong positive correlation over the medium-term between expenditure and smallholder output and the decline of the proportion of undernourished people.

Both infrastructure and extension provide a much more complex challenge, but enhance human capital and complements smallholder knowledge in the field. In addressing food security in Kenya it was recognised that there are many extension service providers within government, NGOs, private sector, religious organisations and community based organisations. There are also considerable resources (human, physical and financial), held by these organisations. The consistency and regularity by which farmers are assured of these resources affect their effectiveness (Kinyua, 2004). Hazell *et al.* (2006) has established that extension visits can change farmers output by more than 25% depending on the level of education of the farmer. In Zambia and Malawi it has been shown that a single extension visit can increase food production when coupled with optimal productive assets. This increases labour use by more than a third from a base of under 9 hours per week (Diao *et al.*, 2007). The Zimbabwean success story of the 1980s mentioned earlier in was heavily influenced by close coordination of all services affecting the production activity including appropriate research and development but crucially, an expanded extension service (Eicher, 1995). If the land reform were to proceed as envisaged in countries like South Africa and Namibia, extension would need to be scaled up quite drastically but that would be result in increases of agriculture output, boosting food security.

As a proxy for support, central government budget allocation to agriculture as a proportion to the total national budget is used in the empirical section. Budget support for agriculture does not include direct support to the sector but is just the proportions of annual allocation to the sector in annual national budgets. It also excludes resources allocated from provincial budgets and those allocated in any supplementary budgets in the course of the different years.

For South Africa, audited expenditure on budget votes shows that the proportion of the national expenditure allocated to agriculture is about 1%, suggesting that there is room for the country to increase its support to smallholder agriculture towards fulfilling its commitment and in so doing boost the livelihoods base of smallholders by effectively lowering the costs of production which would increase output and lower agricultural prices, at least for staples like maize.

Table 59: Budget allocations to the agricultural sector as a percentage of total national budget allocation in the SADC region 2003/2004 to 2006/2007

Country	SADC Summit Declaration	2003/2004	2004/2005	2005/2006	2006/2007
Angola	10	2.24	6.47	5.29	3.55
Botswana	10	2.8	2.7	3.2	3.3
Democratic Republic of Congo	10	ns	ns	ns	ns
Lesotho	10	4.8	5.0	4.0	3.5
Madagascar	10	ns	ns	ns	4.2
Malawi	10	6.6	12.71	11	13.2
Mauritius	10	3.96	2.91	2.56	ns
Mozambique	10	6.2	4.4	3.4	3.9
Namibia	10	7.3	6.9	8.2	8.0
South Africa*	10	0.86	0.93	1.15	1.26
Swaziland	10	4.97	6	4.7	3.71
Tanzania	10	5.7	4.71	5.78	3.78
Zambia	10	7.0	4.0	5.0	ns
Zimbabwe**	10	11.9	3.7	4.6	3.5
SADC average	10	5.77	5.34	5.31	5.46

ns = not submitted to SADC

*This is a total of allocation to the agriculture and the land affairs vote

**Author's calculations from various Reserve Bank of Zimbabwe publications for 2004 to 2007

Source: SADC (2003)

4. Empirical findings: estimating the effects of contributors to food security

The proportion of undernourished people in total population [propunder variable] in a given year is hypothesised to depend on the amount of cereals produced nationally in tonnes [cereals], per capita gross domestic product [GDP], per capita agricultural gross domestic product [agGDP] (all

Of course, budget support cannot on its own achieve the desired result, but in most countries in the region where immediate support is needed central government provision of enabling infrastructure, knowledge and in some cases, inputs can be a strong condition for increased output in small-scale agriculture (Rukuni et al., 2006). If this indeed is the case central government budgetary allocation to the sector should affect the proportion of people undernourished.

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[9] This table is given here for illustrative purposes only. The complete set of figures used in the regression as given in the data table is available on request.

at constant 2000 US$ prices), capital stock in agriculture (constant 1995 US$ prices) [*capstoc*], poverty levels [*pov*] defined as percentage of the population leaving below US$1 per day and proportion of national budget support [*bugs*] to agriculture in the preceding year. The idea is that the proportion of people who will be undernourished next year for example will depend on how much agriculture support and investment is provided in a given year. That is:

$$PU_{t+1} = f(cereals, GDP, agGDP, bugs, agval, pov, capstoc) \qquad (1)$$

Value added is used as a proxy for agricultural processing which is considered to provide alternative employment in rural areas. A simple semi-log linear regression[10] estimated in STATA takes the following form:

$$Ln\,PU_{t+1} = c + \alpha_1\ln(cereals) + \alpha_2\ln(GDP) + \alpha_3\ln(agGDP) + \alpha_4\ln bugs + \alpha_5\ln(agval) + \alpha_6\ln(pov) + \alpha_7\,(capstoc) \qquad (2)$$

where *c* is a constant and α_1 to α_8 are parameters.

4.1 Summary statistics

Data used in this study is extracted from various World Bank National accounts, FAO and UN data sources for 2003[11] to create a cross sectional set of 38 countries in sub-Saharan Africa. There are several shortcomings to this approach. Most prominent are two. Firstly, there are huge variations between countries that make such an approach questionable. Panel data approaches would be better placed to deal with these between country variations. However, given the difficulty of putting together such a panel data set a cross-sectional set was compiled as the next best solution. Secondly, the significance of agriculture in the economies of these countries differs; therefore, some of the explanatory variables we use might actually render the regression results unrealistic for policy in some countries.

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[10] *Several forms of this model were considered, but the semi-log function was chosen over other more elaborate forms due to its simplicity although the model significance for the various options was not hugely different.*
[11] *Please see Table 9 for the definition and sources of the data used in this study.*

Table 6: **Summary statistics for 38 sub-Saharan countries in 2003**

Variable	Mean	Standard deviation
Cereals '000 tonnes	2887.35	673.302
GDP	1203.45	28757.36
Agricultural GDP	298.71	78.9836
Proportion of undernourished	33.76	5.67
Capital stock in agriculture	1.87	1.43
Agricultural value added	679.75	200.19
Poverty	47.77	3.44
Budget support	4.89	4.65

Source: Data set from World Bank, FAO and UN data sources for 2003

However, this does not distract from their use in an analysis like this, whose aim is to learn from evidence from the region and using it to draw implications for South Africa. It is expected that all of the parameters α_i to α_7 will be negatively related to the proportion of the undernourished, with the exception of α_6 since it is expected that the higher the poverty levels the higher the proportion of people who will be in the undernourished group.

4.2   Discussion of the results

The model goodness of fit, R^2 is reasonable for this type data set at 0.4027, which provides a high level of confidence in the validity of the model. Results are largely as expected confirming the validity of drawing variables from the framework employed. As expected the level of cereals produced has an inverse relationship with the proportion of undernourished in the population, indicating that production in these countries is a significant factor in addressing food insecurity. Poverty is a significant predictor of the proportion of people undernourished. The third significant variable is agricultural value added. Agricultural value added per worker, taken as a proxy for off-farm employment, is positive, confirming the idea that policy approaches to reducing food insecurity should consider supporting complementary processing activity within agriculturally important areas. The level of budgetary support too is a significant predictor of success. Scaling-up support to the agricultural sector can therefore be said to have a significant positive impact on food security at an individual level.

Of note, however, is the fact that in these countries taken together at 2003 levels, per capita GDP does not seem to explain food insecurity. In fact, it has an opposite sign from the one expected. This in itself is a strong reminder that growth does not necessarily lead to food insecurity (or vice versa) as other distributional issues tend to come into play. However, one would have expected per capita agricultural GDP to be significant, but this variable too is insignificant although it has the expected sign.

Table 7: Regression results

Variable	Coefficient	t-stat
lncereals	-0.0945	-2.73
lngdp	0.1055	0.79
lnaggdp	-0.1509	-0.87
lnagrieval	-0.3923	-2.96
lnpov	0.0444	4.31
lnhugs	-0.0187	-2.79
capstoc	-0.0267	-1.67
_cons	2.2494	5.21

$R^2 = 0.4027$

A plausible explanation for the insignificance of per capita agricultural GDP might be that it could be correlated to some other variables, meaning that they might be a problem of multicollinearity (Studenmund, 1997; Thomas, 1997). However, this is dispelled by the correlation matrix (Table 9). The only variable that seems to have some significant correlation with this variable is per capita agricultural value added, but even that correlation coefficient is not extra-ordinarily high. Dropping any one of the variables did not seem to change the model results in a hugely significant way either. Nevertheless, a more robust test (the variance inflation factor, VIF) was conducted. The variance inflation factor (VIF) of under 2,392 indicates that multicollinearity is not a significant problem.

Two main problems (among others) are, however noted from these results. Firstly, data used is not smallholder data but is national data; therefore it is difficult to clearly isolate smallholder effects. More effort and disaggregated data is needed for this to be possible. Secondly, levels of education (human capital) strongly alluded to in the framework are not captured in the analysis. This is a major drawback in this article but one that is occasioned by serious data gaps that could not be resolved.

5.   Conclusion

When thinking of ways to boost agricultural production to enhance food security, this article indicates a number of livelihood assets to consider. Evidence in studies of smallholder production from the region suggests that consistent policies on institutional support, production of food and extension can boost the ability of poor households to produce food and providing themselves a livelihood. Efforts to boost agricultural production must focus largely on increasing production and livelihood options. Evidence from the region though patchy and contextual, indicate that where livelihood capital was complete, smallholders increase their output and drive the rural economy with some countries (e.g. Zimbabwe, Malawi and Kenya) experiencing increases (in some circumstances) and decreases (in periods of macroeconomic difficulties and drought years). Realising the potential of food and agricultural production for reducing poverty and hunger depends largely on the extent to which smallholder farmers are able to participate in productive and remunerative farming and off-farm activities and supported by state.

The high levels of hunger in the region, particularly in the rural farm household sector, and the difficulties in reducing it, even when food supplies are high and the economy is growing highlight a fundamental problem of access to food. This cannot simply be addressed solely by state intervention aimed at reducing food prices, since households can only access food if they have some cash income. Additionally, since most poor rural households rely on agricultural production for a significant share of their income, increasing agricultural productivity has a positive impact on increasing food insecurity and reducing rural poverty. For South Africa, this points towards the need to strengthen both agricultural productive capacity of smallholder farmers and their income-generating options. This could include improving their livelihood asset base in order to reduce poverty and improve food security.

Budget support to the agricultural sector was found to lead to a reduction in the number of undernourished people. This suggests that central governments have an important role to play in creating conditions in the sector that could lead to a reduction in food insecurity through support to institutions, extension infrastructure, and other contributions to the creation of an enabling environment (e.g. access to markets, access to

inputs, access to machinery, access to knowledge, access to infrastructure such as fences and boreholes, small business support, support to agricultural processing, access to credit etc). The gaps in knowledge and resources for the creation of a positive enabling environment for poorly resourced rural populations are crucial for addressing food security in the region. This suggests the existence of unexploited or unutilised potential within rural areas that could be unlocked by addressing important aspects of their livelihood asset position in order to overcome key constraints on small-scale production of food.

Acknowledgements

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Appendix

Table 8: Data, definition and source

Variable	Definition and measurement	Source
cereals	Cereal output in thousand tones in 2003	FAO estimates, 2007
GDP	Per capital GDP is GDP divided by midyear population. Data are in constant year 2000 US$ prices	World Bank, National accounts
agGDP	Per capita agricultural GDP of the agricultural population	World Bank, National accounts
propund	Proportion of people undernourished (percentage)	FAO, 2007
capstoc	Estimate of capital stock in agriculture derived by the FAO using data on livestock, tractors, irrigated land, and land under permanent crops and the average prices for the year 1995.	FAO Statistics Division and OECD
agval	Agricultural value added per worker in constant 2000 constant prices is the international standard industrial classification (ISIC) divisions 1-5, it is the net output of a sector after adding all outputs and subtracting all intermediate inputs.	World Bank, National accounts as compiled in FAO, 2007
pov	Poverty is the proportion (in percentage) of population under the poverty below the US$1 PPP per day. This measure was widely used in the early 2000s as a poverty line.	World Development Indicators 2005
bugs	This is the proportion of the national annual state budget allocated to agriculture	UNDATA, National government budget statements

Table 9: Correlation matrix for the variables in the empirical model, equation (2)

	Cereals	GDP	agGDP	propund	capstoc	bugs	agricval	pov
Cereals	1.0000	-0.1073	-0.0365	-0.2489	0.1428	0.1238	0.2357	-0.0162
GDP	-0.1073	1.0000	0.4467	-0.1867	0.2335	0.1055	0.4729	-0.0898
agGDP	-0.0365	0.4467	1.0000	-0.4351	0.2806	0.1031	0.4616	0.0487
propund	-0.2489	-0.1867	-0.4351	1.0000	-0.3910	-0.1679	-0.3556	0.2404
capstoc	0.1428	0.2335	0.2806	-0.3910	1.0000	0.4345	0.2691	-0.1118
bugs	0.1238	0.1055	0.1031	-0.1679	0.4345	1.0000	0.1054	0.1219
agricval	0.2357	0.4729	0.4616	-0.3556	0.2691	0.1054	1.0000	-0.2147
pov	-0.0162	-0.0898	0.0487	0.2404	-0.1118	0.1219	-0.2147	1.0000

Source: Generated by EViews