

# Baseline characterization of production and markets, technologies and preferences, and livelihoods of smallholder farmers and communities affected by HIV/AIDS in Swaziland

## Making Agricultural Innovations Work for Smallholder Farmers Affected by HIV/AIDS in Southern Africa (MIRACLE)

A.D. Alene, M. Khonje, J. Mwalughali, C. Chafuwa, A. Longwe, R. Khataza, E. Kapalasa, I. Madzorera, T. Gondwe, M. Mussagy, P. Ntawuruhunga, S. Boahen, B. Maziya-Dixon, and D. Chikoye



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Baseline Report

The International Institute of Tropical Agriculture (IITA)  
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Cover picture: A farmer receiving seeds to plant during the 2012/2013 cropping season.

# Acronyms and Abbreviations

ARV	antiretroviral drugs
CSO	Central Statistics Office
DID	Difference-in-Difference
FANRPAN	Food Agriculture and Natural Resource Policy Analysis Network
FAO	Food and Agriculture Organization
GDP	gross domestic product
HIV/AIDS	Human Immunodeficiency Virus/ Acquired Immune Deficiency Syndrome
IFAD	International Fund for International Development
IITA	International Institute of Tropical Agriculture
IM&E	Impact Monitoring and Evaluation
MEPD	Ministry of Economic Planning and Development
MIRACLE	Making Agricultural Innovations Work for Smallholder Farmers Affected by HIV/AIDS in Southern Africa
MoAC	Ministry of Agriculture and Co-operatives
NERCHA	National Emergency Response Committee on HIV/AIDS
NGO	nongovernmental organization
PLWHA	Persons Living With HIV and AIDS
SNL	Swazi Nation Land
SSA	sub-Saharan Africa
SVAC	Swaziland National Vulnerability Assessment Committee
SZL	Swaziland Lilangeni
TDL	Title Deed Land
TLU	Tropical Livestock Units
UNAIDS	Joint United Nations Program on HIV/AIDS
UNFCCC	United Nations Framework Convention on Climate Change
US\$	United States Dollar
USAID	United States Agency for International Development



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# Introduction

Agriculture, health, and nutrition are inherently intertwined and all sectors seek to improve human well-being, but agriculture has rarely been explicitly deployed as a tool to address poor health and under-nutrition in developing countries. Poverty is responsible for poor health and under-nutrition, but it is also widely recognized that agriculture has the potential to greatly reduce poverty. Some 75 percent of the world's poor people live in rural areas, and strong agricultural growth could raise the incomes of rural people and help pull millions out of poverty, thus overcoming under-nutrition and poor health. Agriculture is the only realistic way for most people to get the nutrition they need. Farmers are now being encouraged to grow more nutritious crops. One example of this approach is already being tried with an effort to promote biofortified crops—that is, staple crops that have been bred to contain high levels of micronutrients, such as vitamin A or iron. The nutritional quality of foods can also be enhanced during processing and retailing. Consumers can be encouraged to accept, and even seek, more nutritious foods as efforts continue to be made to make such foods available and affordable.

It is worth noting, however, that the links between agriculture and health and nutrition work both ways. Given that agriculture is highly labor-intensive in many poor countries, productive agriculture requires the labor of healthy and well-nourished people. People who suffer from malnutrition and poor health are less able to do the work required for agricultural production. Nutritional deficits and disease have been shown to impair people's physical and cognitive capacities. The result in many regions of the world has been a downward spiral of low agricultural productivity, low income, poverty, and poor nutrition and health.

In an effort to unleash the potential of agriculture and agricultural research to achieve health and nutritional outcomes in Africa, the International Institute of Tropical Agriculture (IITA) and its partners are implementing a multi-country and multi-year project entitled *Making Agricultural Innovations Work for Smallholder Farmers Affected by HIV and AIDS in Southern Africa (MIRACLE)*. The major goal of the project is to improve the health and nutritional status, food security, and income of people affected by HIV and AIDS in Southern Africa through the production, consumption, and marketing of nutritionally-enhanced crop and livestock products, advocating supportive agricultural and health policies, and strengthening the capacity of key stakeholders engaged in agricultural activities. Expected outputs of the project include: (1) strengthened institutions and improved partnership and stakeholder capacity to enhance access to rural support services by people affected by HIV and AIDS; (2) dissemination and deployment of farm productivity-enhancing innovations that improve food security, nutrition, and health; (3) enhanced nutrition through dietary improvement and diversification; (4) successful transition to sustainable reliance on own-produced nutritious foods and income generation; (5) development and promotion of value addition and products from diverse, nutrient-dense crops; and (6) advocacy for appropriate policy options for linking agriculture and nutrition to improved human health.

The project is being implemented in HIV/AIDS hotspots in four countries: Malawi, Mozambique, Swaziland, and Zambia. The priority action sites are those where research and development partners already have ongoing activities, such as the provision of antiretroviral drugs (ARVs) and nutrition or agriculture interventions. The MIRACLE project adds value to the existing initiatives by improving linkages between agriculture, nutrition, and health. As one of the countries highly dependent on agriculture and affected by HIV/AIDS in Southern Africa, Swaziland is one of the target countries for the MIRACLE project. Indeed, Swaziland is one of the most severely HIV/AIDS-affected countries in the world. Several studies have investigated the impact of HIV/AIDS on agriculture and food security in Swaziland (Masuku Muwanga 2002; Mushala 2002; Masuku 2006; Masuku and Sithole 2009). Because of increased mortality and morbidity, the household labor pool for both commercial and subsistence agriculture is also affected. The deaths of productive adults aged 15–49 years from HIV/AIDS reduce productivity and caring capacity. Family members spend most of their time taking care of the sick and so have little time to focus on agricultural pursuits. This especially makes women more vulnerable as they are the caregivers when men fall sick. As a result, security in household food and nutrition is crippled by the effects of the epidemic.

This report presents the results of the baseline survey of households and communities conducted in six target districts in Swaziland in May and June 2012. The purpose of the baseline studies and situation analyses is to establish a strong knowledge base to contribute to an increased understanding of the production and market constraints; the role and constraints to the adoption of technologies; and the livelihood strategies and outcomes (food, nutrition, and health) of smallholder producers affected by HIV/AIDS. An important output is a description of the production and market constraints and opportunities and the analyses of the livelihood status and strategies of producers, as well as the prospects of alternative investments and technological solutions. This guides investments in agricultural research, institutional innovations, and complementary public goods for income gains, food and nutrition security, improved health outcomes, and poverty reduction. The results of the baseline studies form the basis for assessing the progress and primary or adopter-level impacts of the project.

The baseline report is organized in nine sections. The following section describes the link between agriculture, nutrition, and HIV/AIDS in Swaziland. The study methodology, including a description of the survey areas, sample survey design, and analytical methods, is presented in the third section. The fourth section describes the socioeconomic characteristics as well as resource endowments of the households, whereas the fifth section summarizes the crop production and marketing practices of the households, focusing on cropping patterns, production constraints, and market participation. The sixth section presents results relating to improved crop variety adoption practices of the households in the study area. The seventh section presents the analysis of poverty and household welfare in the study area. Community analysis is discussed in the eighth section and this includes a description of public services and various coping strategies communities have adopted to mitigate the impact of HIV/AIDS on livelihoods. The last section provides a summary of the major results of the baseline survey.

# Agriculture, Nutrition, and HIV/AIDS in Swaziland

Swaziland is a land-locked and mountainous country covering 17,364 km<sup>2</sup> of which 56 percent is Swazi Nation Land (SNL) and 44 percent is Title Deed Land (TDL). While SNL farmers mainly produce crops for own consumption, TDL farmers produce crops for commercial purposes. Arable land makes up about 11 percent of the total surface area. According to Mlilo et al. (2011), the cultivated area is estimated at 190,000 ha (178,000 ha under annual crops and 12,000 ha under permanent crops). Significant cattle populations utilize the extensive mountain range lands and semi-arid areas of the Lowveld in a mixed farming system. The country is divided into four agroecological zones—the Lubombo Plateau, the Lowveld, the Middleveld, and the Highveld. Swaziland experiences prolonged periods of drought during the winter months when there is little or no rainfall. The subtropical climate is characterized by wide ranges in total annual rainfall, including periods of drought that particularly affect the Lowveld and Middleveld. Even in the summer rainy months, consistent rainfall cannot be expected. Thus, many parts of the country often do not receive sufficiently persistent rainfall to accumulate enough moisture in the soil for growing crops. However, in addition to protracted dry spells, heavy rainfall, storms, and flooding also have a negative impact on agricultural production.

## Agricultural production in Swaziland

Most of Swaziland's population relies on subsistence farming. Agriculture and the agro-industry form the basis of the economy. The agriculture sector is a major export earner and contributes about 8.2 percent of the GDP (CIA 2012). It is also a key supplier to many of the country's manufacturing industries, particularly operations which utilize sugar and wood.

Agricultural production in Swaziland is characterized by arable crop farming and livestock production. The achievement of sustained and equitable agricultural development remains the greatest challenge facing the Swazi Nation. Swaziland's potential for greater growth and development lies in the agricultural sector, which contributes a large proportion of the GDP. In Swaziland, agriculture portrays a distinct bimodal pattern of ownership, production technology, and output. There is a substantial agricultural subsector which operates on TDL and is characterized by relatively high capital intensity, cash cropping, and large farms (Muvimbela et al. 2010). These produce sugar and other high-value crops such as citrus, potato, and vegetables.

There is also the traditional smallholder agricultural subsector operating in SNL. About 70 percent of the country's population lives in rural areas and on SNL. Most of these are smallholder farmers who depend on subsistence agriculture for survival (Government of Swaziland 2008). Subsistence agriculture employs about 60 percent of the population. The majority of Swazi households grow rain-fed maize, vegetables, and some cotton on land allocated to them by traditional chiefs. The SNL is also characterized by large numbers of livestock grazing on communal pastures.

Despite substantial gains in social indicators, such as life expectancy, infant mortality, and gross primary school enrolment due to economic gains between 1982 and 1991 (World Bank 2001), the economic performance of Swaziland had a downturn in the 1990s because of factors such as adverse weather conditions that have led to a steady decline in agricultural production, mainly in the traditional sector (Mushala 2002). The HIV/AIDS pandemic also ravages productive human resources. The impacts of HIV/AIDS on the agricultural sector include reduced farm productivity from an acute shortage of household and farm labor, a substantial reduction in cultivated area, delays in farm operations, a decline in livestock production, and a loss of agricultural knowledge and management skills, which result in increased vulnerability to food shortages and poverty. HIV infection creates a vicious cycle limiting productivity and exacerbating malnutrition and food insecurity. In turn, malnutrition and food insecurity synergistically limit a person's ability to cope with the disease and worsen its impact (Nkambule 2011). These have led to fluctuations in the economic growth of the country, which has recently been a matter of concern to the Swazi Government.

## HIV/AIDS in Swaziland

Swaziland has the highest rate of HIV/AIDS prevalence in the world, a much higher rate than the average across the sub-Saharan African region (Kates and Leggoe 2005). The first cases of AIDS in Swaziland were reported in

1986. Since then, the virus has spread at an alarming rate. According to UNAIDS (2009), the adult prevalence rate is 26 percent. In 1999, the king declared HIV/AIDS a national disaster and the Crisis Management and Technical Committee was established which was later dissolved after the National Emergency Response Committee on HIV/AIDS (NERCHA) was set up.

Women have been particularly affected by the pandemic as among the population aged 15–49, HIV prevalence is 31 percent among women compared with 20 percent among men. This is due to women's biological and cultural disposition that places them at a higher risk of transmission, social disempowerment, and the inability generally to make decisions concerning sexual issues. This is exacerbated by their early onset of sexual activity and their inability to influence the sexual practices of their partners (World Bank 2001). The Swaziland Demographic and Health Survey of 2006/2007 reported that by region, the HIV epidemic exhibits some degree of heterogeneity, with the prevalence rate in the population aged 2 years and older ranging from 18.7 percent in Shiselweni to 24.2 percent in Hhohho. The regional differential is also marked in the case of older adults, whereby 8 percent of the population aged 50 and older are HIV positive in Shiselweni compared with 15–17 percent in the other three regions (CSO 2008).

### **Food security, nutrition, and HIV/AIDS**

In its earlier stages, the HIV/AIDS epidemic was predominantly an urban problem. Now the epidemic has rapidly moved into rural areas where a significant proportion of the population are among the least privileged and bear the greatest burden of its impact as they mainly depend on the labor-intensive agricultural sector. The impact of HIV/AIDS on household welfare starts at the physiological level. HIV/AIDS creates a vicious cycle by weakening the immune system, nutrient intake, absorption, and use (Ngwira et al. 2001). This increases susceptibility to opportunistic infections, such as malaria and tuberculosis that eventually hinder the individual from undertaking productive activities, such as agricultural work. As a result, food production and household income decrease, leading to low nutritional levels and worsening the HIV infection. Adults living with HIV have energy requirements that are 10–30 percent higher than those of a healthy adult without HIV, and children living with HIV have requirements that are 50–100 percent higher than normal. Good nutrition and sufficient food are therefore essential in keeping people living with HIV/AIDS healthy for longer (UNAIDS 2008).

The cost of care for people living with HIV/AIDS is considerably higher than that of most common diseases. People living with HIV/AIDS require good nutrition to stay healthy, and this has to be sustained in the long run. They also require regular treatment for the opportunistic infections that come with the disease. In addition, when adults in their productive ages are infected and labor supply is reduced, the household resorts to hiring farm labor for work which they could have undertaken on their own if they had been healthy. Cash income and labor are partly diverted to cope with and/or compensate for the effect of HIV/AIDS, leaving less labor for farm and off-farm activities as well as reducing the amount of money available to the household (Haslwimmer 1994). Deaths from HIV/AIDS represent an added strain on grandparents and extended families that have to look after orphans left behind. Thus HIV/AIDS brings about economic losses to the household.

Studies have reported that, in Swaziland, the most affected component of agriculture was the livestock sector where, as a result of the pandemic, households had resorted to the sale of their livestock as a means of sustenance and to pay for medical and funeral bills (Masuku 2006; Masuku and Sithole 2009). Crop production had diminished as a result of the fall in land utilization, unaffordable inputs, the diversion of household labor to caring for the sick, and skilled people falling sick or dying, leaving behind people with limited skills on how to manage crop production. In addition to selling livestock, affected households also sell physical household assets to cope with loss of finances such as remittances and wages after the illness or death of a productive member of the household.

The project will build on the achievements of the grassroots HIV/AIDS project in Swaziland, which is a community-based project with activities including looking after orphans and vulnerable children, assisting the elderly who must care for children without parents, organizing school fees and uniforms, and ensuring people understand the drugs they need to take and stay with the daily regime. The project also assists through income-earning activities such as planting vegetable gardens and raising pigs.



**Table 1. Distribution of sample households in Swaziland.**

Region	Inkhundla	Chiefdom	Number of households in Chiefdom (nHH)	Number of households as a proportion of the total ( $p_{HH} = n_{HH} / \sum n_{HH}$ )	Sample households ( $p_{HH} * \sum n_{HH}$ )
Lubombo	Mpolojeni	Ndzangu	233	0.05	37
Lubombo	Mpolojeni	Shoba	606	0.14	95
Lubombo	Tikhuba	Maphungwane	839	0.19	131
Lubombo	Lungongolwe	Langa	161	0.04	25
Shiselweni	Mtsambama	Gwegwe	274	0.06	43
Manzini	Mafutseni	Mafutseni	1409	0.32	221
Hhohho	Nkhaba	Nkhaba	844	0.19	132
Total			4366	1.00	684

(Table 1). The sample households were selected randomly from a sampling frame of households prepared for each target chiefdom through a census undertaken prior to the commencement of the actual survey. As not all households in target chiefdoms will be likely to be reached through the MIRACLE project in just three years, each such chiefdom is expected to have both beneficiary and non-beneficiary households.

Detailed household level data collected using semi-structured questionnaires provided most of the information used to address the research questions, whereas community-level analysis provided useful in-depth information on livelihood and infrastructural conditions of the communities in the study areas. The community-level surveys involved focus group discussions in the selected communities and interviews with key informants. The survey collected information on household demographics; farm and household assets; agricultural input use and crop production; marketing of crop and livestock products; sources of household income (both farm and non-farm income); extension services and technology adoption; farmers' groups and social capital; shocks and coping strategies; and household and livelihood dynamics.

### Analytical framework

The MIRACLE project is geographically wide and the beneficiaries have diverse characteristics. It is therefore plausible to evaluate the project's impact using the counterfactual impact evaluation framework. Project outcomes are estimated by computing a double difference, one over time (before–after) and one across households (between beneficiaries and non-beneficiaries). This type of evaluation is called the Difference-in-Difference (DID) method. Figure 3 illustrates the Difference-in-Difference impact evaluation framework. Since the work by Ashenfelter and Card (1985), the use of Difference-in-Difference methods has become very widespread. The simplest set-up is one where outcomes are observed for two groups for two time periods. One of the groups is exposed to a treatment in the second period but not in the first period. The second group is not exposed to the treatment during either period. In the case where the same units within a group are observed in each time period, the average gain in the second (control) group is subtracted from the average gain in the first (treatment) group. This removes biases in second period comparisons between the treatment and control group that could be the result of permanent differences between those groups, as well as biases from comparisons over time in the treatment group that could be the result of trends.

The information captured in this study will therefore be used as a benchmark for subsequent assessments of efficacy in project implementation and the eventual impacts of the project. The baseline study aims to contribute to an increased understanding of production constraints, the role and constraints to adoption of improved technologies, and the preferences and livelihood status and strategies of farmers affected by HIV/AIDS. Descriptions of constraints and opportunities in crop and livestock production and analyses of the livelihood status and strategies of producers as well as the prospects of alternative investments and technological

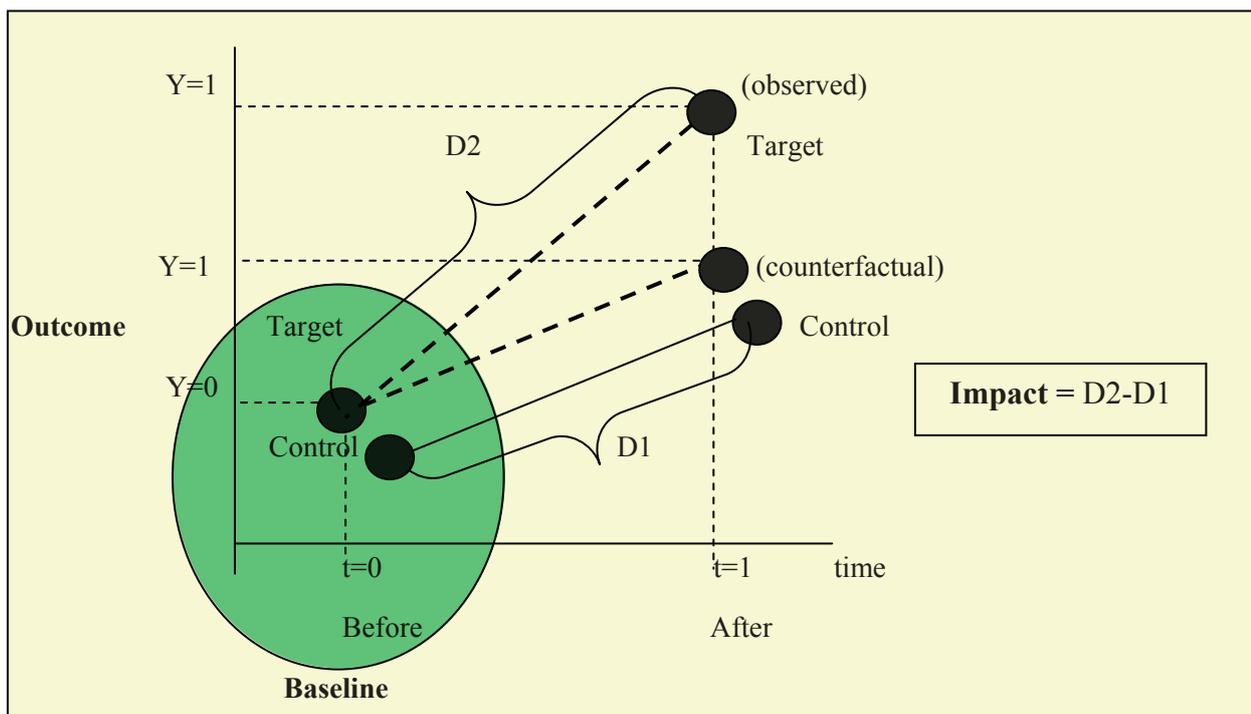


Figure 2. Difference-in-Difference impact evaluation method.

solutions will guide investments in research, institutional innovations, and complementary public goods for income gains and poverty reduction.

Early adoption and impact studies will be conducted to assess the extent, pathways, and determinants of technology adoption as well as the farm-level or primary impacts of maize–legume technologies among adopters in the target areas where there is significant early adoption at the end of the project. Using standardized protocols, early adoption and impact studies will be conducted across the target/pilot sites to identify the extent, determinants, and pathways of the adoption of improved varieties and management practices. The timing of these surveys will be towards the end of the project when significant adoption of improved varieties and practices will be likely to have taken place in the pilot sites and communities. Research hypotheses will be formulated to test and explain gender differentials in adoption and impacts of improved technologies with a view to enhancing the intra-household distribution of the benefits from research and extension in major staple crops. Indeed, not only are there gender differentials in technology adoption, but technology adoption may also have differential effects within and across households because of the influence of social structures as well as gender imbalances in access to productive assets and support services.

Quantitative and qualitative methods are employed in the baseline study. In addition to descriptive analysis, an econometric logistic regression model was developed and estimated for the analysis of the determinants and correlates of household poverty in the study area. Community analysis is carried out to get an in-depth assessment of key community issues.

### The logistic regression model of determinants and correlates of poverty

This study employs a logistic regression model to assess the determinants and correlates of poverty in the study area. This is a univariate binary model in which it is assumed that the probability of being poor (captured by a dichotomous variable) is determined by an underlying latent variable that captures the true economic status of an individual household. This dichotomous variable is regressed on a set of supposed explanatory variables hypothesized to influence poverty in the area.

Denoting the latent variable of the  $i$ -th household as  $Y^*$ , the combined effect of the explanatory variables inducing or reducing poverty can be expressed as a linear function as follows:

$$Y^* = X_i' \beta + \varepsilon_i \dots\dots\dots (2)$$

where  $\beta$  is the vector of unknown parameters to be estimated and  $X_i$  is the vector of explanatory variables. The error term represents factors that are unobservable to the researcher but are relevant in determining whether or not a household is poor. It is assumed to be random, independently and normally distributed, with zero mean and a constant variance  $\sigma^2$ .

Since  $Y^*$  is not observable, the model is specified using the observed poverty status denoted as  $Y$ , relating to the classification of sample households into poor and non-poor based on whether they are above or below the purchasing power parity exchange rate poverty line of SZL1832/capita/year (US\$1.25/capita/day). It is related to the latent variable as follows:

$$\begin{aligned} Y &= 1 \text{ if } Y^* > 0 \text{ (poor household)} \\ &= 0 \text{ otherwise (non-poor household)} \dots\dots\dots (3) \end{aligned}$$

The probability that a given household is poor can be defined as

$$\Pr(Y=1) = G(X_i' \beta) \dots\dots\dots (4)$$

where  $G(\cdot)$  is the cumulative distribution of the error term, with the assumption that it has a symmetric distribution. The value of  $G(\cdot)$  has to be between 0 and 1 since it represents the probability (Wooldridge 2009).

The logit model follows a logistic distribution and so the probability of a household being poor is expressed in terms of the cumulative function for a standard logistic random variable. Thus, this probability is given by

$$\Pr(Y = 1) = \Omega = \frac{\exp(X_i' \beta)}{[1 + \exp(X_i' \beta)]} \dots\dots\dots (5)$$

where  $\Omega$  is the conditional probability of a household being poor. In the form of the ratio of the probability of being poor to the probability of being non-poor (log odds ratio), the logistic regression model can be expressed as

$$\ln\left(\frac{\Omega}{1 - \Omega}\right) = X_i' \beta + \varepsilon_i \dots\dots\dots (6)$$

This ratio will give the odds that a household is poor. A positive sign of estimated coefficients would mean that the probability of being poor is higher than the reference category and vice versa keeping all other characteristics constant. According to Hoffman (2004), "... a number greater than one of log odds indicates a positive association between independent and dependent variable, while a number between zero and one indicates negative association among both". The marginal effect of a given explanatory variable  $j$  on the probability of household  $i$  being poor is given by

$$\frac{\partial \Omega_i}{\partial X_{ij}} = \Omega_i(1 - \Omega_i) \beta_j \dots\dots\dots (7)$$

Limited access to land, low education levels, poor health status, limited off-farm employment, and lack of access to credit are seen as the principal causes of poverty in Malawi (GoM 2002). However, some of these causes are also consequences of poverty, e.g., poor education and ill-health (Bwalya et al. 2004). Based on the Malawi Poverty and Vulnerability Assessment report, some of the possible determinants of poverty can broadly be categorized as follows:

**Demographic:** Indicators of household size and structure are important in that they show a possible correlation between the level of poverty and household composition. Age and sex of the household head, dependency ratio, and household size were included in this analysis. It is hypothesized that household poverty is positively correlated with the age of the household head, dependency ratio, household size, and female household-headship. Mukherjee and Benson (1998) reported that households headed by older individuals in rural areas, holding other variables constant, will tend to be poorer than those headed by younger individuals. Similarly, poor households tend to be larger than non-poor households, have higher dependency ratios, and a larger number of children (GoM 2006). Furthermore, the economic vulnerability of poor African women flows mostly from their weakly defined property rights to major productive assets, such as land or livestock, in countries where a combination of customs and laws restrict their ability to own and manage land (McFerson 2010). It is therefore expected that female headship will positively influence household poverty.

**Education:** This is captured by the household head's total number of years in school. Poor households tend to be headed by persons with little or no education (GoM 2006). A negative correlation is expected between education and poverty.

**Employment and occupation:** The share of off-farm income in total household income captures the effects of the distribution of different sorts of occupation at the household level. In an analysis of the livelihood strategies of resource-poor farmers in *Striga*-infested areas of western Kenya, Manyong et al. (2007) found that an increase in the share of off-farm income in total household income would reduce the household's probability of being poor. We therefore expect a negative relationship between poverty and the share of off-farm income in total household income.

**Agriculture:** In a study to explore how farm productivity affects household poverty in Tanzania, Sarris et al. (2006) reported that poorer households not only possess fewer assets but are also less productive. In addition, agricultural productivity directly affects household consumption and hence general poverty and welfare. Variables, such as the total cultivated land held by the household, the estimated value of farm assets, and the household's ownership of livestock were included to capture the link between agriculture and poverty. In any country as highly agricultural as Swaziland, ownership of land will play an important role in determining the levels of poverty. A negative relationship is therefore hypothesized between agriculture and the household poverty status.

**Access to public support services:** This is captured by the household's access to credit and extension services. Policies and institutions that facilitate easier access by farmers to seasonal credit for intermediate inputs were cited as important in increasing agricultural productivity and reducing poverty in Tanzania (Sarris et al. 2006). Similarly, agricultural education, extension, and advisory services are a critical means of addressing rural poverty, since such institutions have a mandate to transfer technology, support learning, assist farmers in problem-solving, and enable farmers to become more actively embedded in the agricultural knowledge and information system (Christopoulos and Kidd 2000). Access to credit and extension services are therefore hypothesized to have a negative correlation with poverty.

**HIV/AIDS:** In a study to simulate the impact of HIV/AIDS on poverty and inequality in selected sub-Saharan countries, Salinas and Haacker (2009) found that the epidemic lowers average income and increases poverty. Proxy variables were therefore used in this study to capture the influence of HIV/AIDS on household poverty. Variables included in the analysis are whether or not the household keeps orphans and sick people. Orphans are one of the groups most affected by poverty. Most of them live with grandparents who are usually single and resource-constrained, thereby being more vulnerable to poverty. It is worth noting that these proxies may over-/under-estimate the presence of HIV/AIDS in the households, given that it is impossible to ascertain from the survey if someone is infected or has died of AIDS since the information is so sensitive.

**Location fixed effects variables:** District dummies are included to capture fixed differences in agricultural production potentials among the study districts.

# Socioeconomic Characteristics of the Sample Households

## Household characteristics

Household-specific characteristics comprise the demographic descriptors of a representative individual—in this case the household head (e.g., age, gender, number of years of schooling) as well as broadly defined household-level characteristics (e.g., household size and dependency ratio). These play a key role in determining the livelihoods of rural households. Household headship is predominantly male in most parts of Africa. In this study, male-headed households form a larger proportion of the sample (58 percent) as reported in Table 2. By region, there are more female-headed households in Manzini. This may be due to the high incidence of HIV/AIDS in the region as indicated by the high proportions of widowed households and households with orphans. Education is a key determinant of the lifestyle and status that an individual enjoys in society. Studies have consistently found that education attainment has a positive effect on health behaviors and attitudes (CSO 2008). The majority of household heads are literate (able to read and write). However, the average number of school years attended by the household head is considerably low (6 years). Lubombo has the highest proportion of illiterate household heads across the regions.

Despite some significant benefits in having other members in a household (such an increase in the household labor supply), generally household size has a negative correlation with socioeconomic status. Large household size results in pressure on household resources due to the high demand. The average mean household size is 7. This is higher than the national average household size of 4.6 as reported in the Swaziland Demographic and Health Survey of 2006/2007 (CSO 2008).

By relating the group of the population most likely to be economically dependent (net consumers) to the group most likely to be economically active (net producers), the dependency ratio highlights the potential dependency burden on workers. A dependency ratio of 0.9 indicates that the number of dependent persons (children below 15 years and adults over 64 years of age) is just about equal to the number of working-age persons (15–64 years) in the population.

## Productive assets

### Land

Land is the most important household asset in Swaziland. This study mainly focuses on smallholder farmers generally operating on the Swazi Nation Land. This land is communal and is held in trust for the nation by the King through chiefs who allocate usufruct rights to individual Swazi families. The smallholder agricultural sector in Swaziland is the largest contributor to the livelihoods of the majority of the population and is the main provider of raw material for the agro-based industries (SVAC 2006). However, due to population pressure, the sizes of landholdings on SNL are small and becoming fragmented. In 2000/2001, the size of landholdings for households was about 1 ha. The average total cultivated land in the sampled households is 1.2 ha (Table 2), with Hhohho households having cultivated land of the smallest size (0.8 ha)

### Livestock ownership

In many developing countries, keeping livestock is a multi-functional activity. Beyond their direct role in generating food and income, livestock are a valuable asset, serving as a store of wealth, collateral for credit, and an essential safety net during times of crisis (FAO 2009). Ownership of livestock, especially cattle, is a cardinal aspect of wealth in Swaziland (SVAC 2007). Cattle comprise the largest component of Swaziland's livestock population. They have always been the Swazi currency as they are used to pay bride dowries, fines for offences, and gifts to and from royalty. The traditional belief that they represent wealth has hampered beef production and caused serious problems of overgrazing and soil erosion. This has necessitated a Government policy to commercialize the national herd, supported by the Swaziland Meat Industries who run the EU standard abattoir. The 2006/2007 Swaziland Health and Demographic survey found that about 70 percent of the population possesses livestock/farm animals, such as cattle, horses, donkeys, mules, goats, sheep, or chickens (CSO 2008). In 2001, Swaziland had about 615,000 head of cattle, 422,000 goats, 27,000 sheep, 300,000 hogs, 16,000 equines, and 3.2 million chickens.

**Table 2. Socioeconomic characteristics of the sample households in Swaziland.**

Characteristics	Region			All (n = 669)
	Hhohho (n = 134)	Lubombo (n = 277)	Manzini (n = 258)	
<b>Household demography</b>				
Male-headed households (%)	65	60	52	58
Female-headed households (%)	35	40	48	42
Household size	6	7	7	7
Dependency ratio (all)	0.9	1.0	0.9	0.9
Age of the household head (years)	54	54	57	55
Widowed household heads (%)	27	35	34	33
Households with orphans (%)	43	57	61	56
<b>Education of head</b>				
Years of schooling	8	4	7	6
Illiterate household heads (%)	11	35	13	22
<b>Asset ownership</b>				
Total cultivated land (ha)	0.8	1.3	1.2	1.2
Livestock ownership (TLU)	2.6	3.5	3.6	3.3
Hoe (%)	93	91	96	93
Mobile phone (%)	93	86	94	90
Machete (%)	84	87	90	87
Spade (%)	87	81	91	86
Radio (%)	79	54	80	69
TV (%)	47	18	46	34
Plough (%)	13	15	16	15
Sprayer (%)	10	14	10	11
Tractor (%)	7	6	6	6
Bicycle (%)	2	9	5	6
Irrigation pump (%)	3	2	4	3
House roofed with iron sheets (%)	84	60	92	77
House with cemented floor (%)	75	65	86	75

Note: TLU = Tropical Livestock Unit.

To describe livestock numbers of various species as a single figure that expresses the total amount of livestock present—irrespective of the specific composition—there is need to use a common unit of measurement. The concept of Tropical Livestock Units (TLU) provides a convenient method for quantifying a wide range of different livestock types and sizes in a standardized manner. Households in the study area possess 3.3 TLU on average. In addition to having small cultivated landholdings, households in Hhohho also have the smallest livestock ownership among the regions. This may be an indication that capital-enhancing interventions are required in the region.

## Household assets

The availability of durable consumer goods is a good indicator of a household's socioeconomic status. Moreover, each particular item has specific benefits. For instance, having access to a radio or a television set exposes household members to innovative ideas; a refrigerator prolongs the wholesomeness of foods; and a

means of transport allows greater access to many services away from the local area (CSO 2008). By assessing the livelihood assets owned by a household, researchers can determine household vulnerability and provide evidence to inform investment decisions around the design of policy responses and program interventions aimed at strengthening household resilience.

The characteristics of dwellings reflect a household's socioeconomic status. For instance, the type of material used for flooring to some extent determines the household's vulnerability and exposure to disease-causing agents (CSO 2008). More than three-quarters of the households use corrugated iron sheets as roofing material and cement for flooring. Across regions, the proportions of households with such roofing and flooring material are highest in Manzini. As a social indicator of wealth, this shows that households in Manzini are less poor than those in the other regions.

This is indicated by the large proportion of households (93 percent) that possess hoes. Other agricultural assets owned by the households include machetes, spades, plows, and sprayers. Tractors (6 percent) and irrigation pumps (3 percent) are recorded in a small proportion of the households.

The majority of households in the study areas have access to a communication network. This is indicated by the fact that 90 percent of the households reported possessing a mobile phone. Although Manzini has the highest proportion of households owning mobile phones, there is little variation across the regions. Radios are a common household asset found in 69 percent of the households. Consistent with past evidence (e.g., CSO 2008), fewer households, on the other hand, possess a television set (34 percent). As a means of transport, bicycles are found in only 6 percent of the households, with the proportion of households being highest in Hhohho.

# Crop Production and Marketing

The agriculture sector plays a very important role in national development in Swaziland, and is one of the leading sectors contributing to GDP. Based on analysis of the survey data, this section describes the crop production and marketing practices of the households. This includes cropping patterns and farmers' market participation. The reference period for the cropping season covered during the survey period is that of 2011–2012.

## Cropping patterns

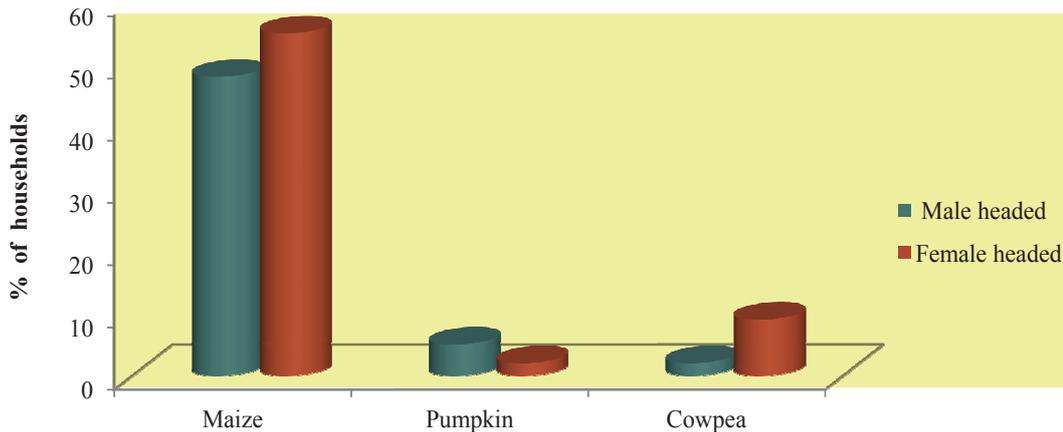
The important crops grown in Swazi Nation Land (SNL) are maize, cotton, and vegetables, while in Title Deed Land (TDL) they are sugarcane, cotton, and citrus. Crops grown in TDL are mainly for export, while those in SNL are mainly for subsistence purposes, with the exception of cotton, which is a primary source of income. In Swaziland, subsistence farmers tend to diversify their production of crops by growing a mixture of maize and other crops, such as beans, groundnut, and Irish potato, in the same field. These farmers often sell their produce only when financial needs dictate and most yields are consumed by residents of the adjacent homesteads (UNFCCC 2004). Most agricultural production on SNL is rain-fed and is, consequently, very vulnerable to adverse climatic conditions, such as drought.

Maize is the staple food of Swaziland and it is used as a measure of food security. Its shortage in households is deemed a sign of a food crisis (FAO 2005). Survey results show that the majority (93 percent) of households grew maize in the 2011/2012 cropping season (Table 3). The proportion of households engaged in maize production is consistently high across the regions. Vegetables were grown by all the households in Manzini and Hhohho. Although cotton is an important crop in the area, none of the households in Hhohho reported they were growing it. Other crops grown by farmers in the study area include pumpkin (60 percent), cowpea (55 percent), cassava (35 percent), sorghum (35 percent), sesame (29 percent), groundnut (24 percent), and sweetpotato (24 percent). Sunflower was grown only in Manzini; yam is predominant in Hhohho.

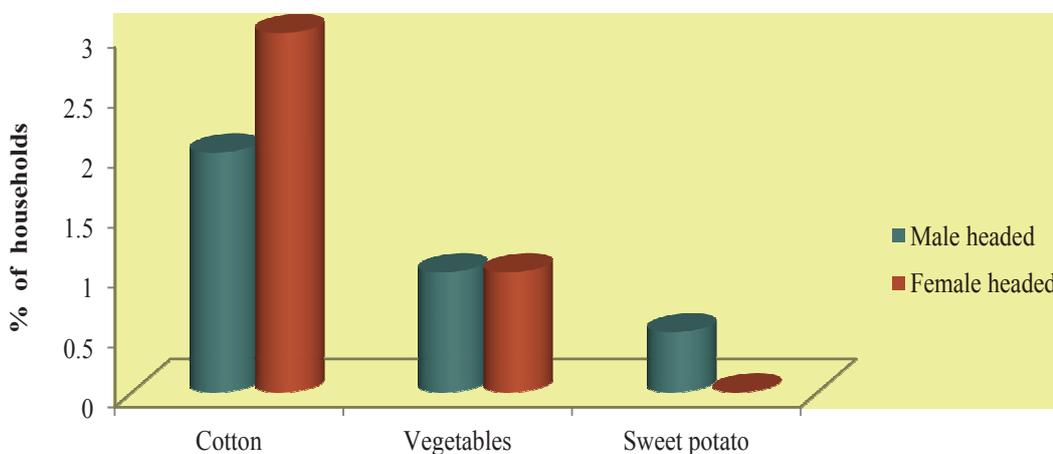
The major food crops grown by farmers are maize, pumpkin, and cowpea. Although there are no substantial differences in the proportions of households growing these crops by gender of the household head, it is evident from Figure 3 that female-headed households are dominant. This is unsurprising, as women are the major producers of food in Swaziland.

**Table 3. Proportion of households that produced the major crops in Swaziland (%).**

Crop	Region			All
	Hhohho	Lubombo	Manzini	
Vegetables	100	88	100	96
Maize	90	91	96	93
Cotton	0	95	50	91
Pumpkin	48	70	57	60
Cowpea	25	57	55	55
Cassava	0	35	40	35
Sorghum	0	50	23	35
Sesame	0	25	33	29
Groundnut	4	17	37	24
Sweetpotato	14	19	29	24
Pigeon pea	0	20	0	17
Beans	19	5	10	9
Irish potato	24	0	1	4
Sunflower	–	–	100	100
Yam	100	–	–	100



**Figure 3. Major food crops grown by the sample households in Swaziland.**



**Figure 4. Major cash crops grown by the sample households in Swaziland.**

Cotton, vegetables, and sweetpotato are the major cash crops in the study area. There is a larger proportion of female-headed households (3 percent) engaged in the production of cotton in comparison with male-headed households (2 percent). Interestingly, none of the female-headed households reported growing sweetpotato despite it being a less labor-intensive crop than most of the other crops grown by the households.

One way of assessing the relative importance of various crops grown by the sampled households is to analyze household land allocation to different crops. Maize is allocated the largest share of total cultivated land (83 percent) (Table 4). This is consistent with the findings of UNFCCC (2004) who stated that a large part of the SNL is under the production of maize, the staple food of Swaziland.

Pumpkins are allocated about half of the total cultivated land. On the other hand, vegetables are allocated only 16 percent of the total cultivated land despite being grown by the majority of the households. Vegetable production is predominant in Hhohho. Households in Lubombo allocated a larger share of the total cultivated land to cassava than households in Manzini and Hhoho. According to SVAC (2006), cassava cultivation has emerged in the Lubombo Plateau.

Women in Swaziland play a significant role in agricultural production, especially since a large percentage of men migrate in search of employment. The women, in their capacity as household heads, have to combine the roles of mother and farmer during their husbands' absence. This, in addition to the toll of HIV/AIDS, has therefore entrenched women's primary role in food and agriculture (IFAD 2007). It has been estimated

**Table 4. Share of major crops in total cultivated land in Swaziland (%).**

Crop	Region			All
	Hhohho	Lubombo	Manzini	
Maize	82	81	85	83
Pumpkin	45	59	43	49
Sunflower	–	–	46	46
Cotton	0	46	38	46
Cowpea	4	21	24	22
Sesame	0	29	4	18
Yam	17	–	–	17
Vegetables	36	13	13	16
Sorghum	0	19	6	12
Cassava	0	8	3	7
Sweetpotato	6	6	8	7
Groundnut	1	3	13	7
Paprika	0	8	1	5
Beans	9	2	4	4

**Table 5. Share of major crops in total cultivated land by gender in Swaziland (%).**

	Male	Female	All
Maize	81	85	83
Pumpkin	45	54	49
Sunflower	25	67	46
Cotton	50	38	46
Cowpea	13	32	22
Sesame	7	33	18
Yams	17	0	17
Vegetables	15	20	16
Sorghum	11	14	12
Cassava	5	10	7
Sweetpotato	6	10	7
Groundnut	5	11	7
Paprika	1	10	5
Beans	3	4	4

that women perform approximately 70 percent of all agricultural labor, including ridging, planting, weeding, hoeing, harvesting, and processing. Although women's contribution to agricultural production has increased with the outmigration of Swazi men, women have always provided the majority of agricultural labor with the assistance of their children (Sachs and Roach 1983). Table 5 shows that women allocated larger shares of household cultivated land to most of the major crops including maize, pumpkin, and cowpea than male-headed households.

### Market participation

According to Markelova et al. (2009), improving smallholder farmers' access to markets is considered essential in enhancing their income and increasing the number of marketing options available to them. Difficulties in market access limit farmers' income-generating opportunities. While large-scale commercial farmers in Swaziland are doing their best to increase agricultural production, the smallholder farmers are still lagging

**Table 6. Proportion of producers of major crops who also sold their crops (% of households).**

Crop	Region			All
	Hhohho	Lubombo	Manzini	
Cotton	0	90	50	86
Cassava	0	12	0	10
Sweetpotato	3	4	7	5
Maize	1	4	7	5
Paprika	0	7	0	4
Groundnut	0	2	6	3
Tomato	0	5	3	3
Irish potato	18	1	0	3
Cowpea	0	2	3	2
Sorghum	0	5	0	2

behind. Consequently, the long-term development in agriculture in Swaziland is based on realizing the potential of smallholder agriculture. Raising the productivity and incomes of smallholder farmers is the most direct route towards achieving agricultural growth (Mhlanga and Mlilo 2011). The main objective of the Ministry of Agriculture and Co-operatives (MoAC) is to provide guidance to the various agricultural subsectors and promote the development of viable cooperative activities which aim to assist members with marketing their produce and the provision of supplies (Government of Swaziland 1999; MoAC 1999).

### **Crop market participation**

Although smallholder agricultural production in Swaziland is mainly for subsistence, some surplus is sold for income. Most yields are consumed by residents of the adjacent homesteads and farmers often sell their produce only when financial needs dictate. Households make choices on how much to store and how much to sell, depending on the market price, their own consumption needs, storage facilities, and their needs for immediate cash. If the local distribution and marketing system is efficient, they can rely on food being available for purchase all the year round, but if they are isolated for at least part of the year through bad roads and lack of transport, their food security will be more at risk and home storage is likely to receive a higher priority. A good marketing infrastructure, the maintenance of rural roads, and provision of marketing services have profound effects on food availability, market prices, and physical access to food at the community level.

Cotton is the most significant cash crop in Swaziland. Of the cotton-producing households in the area, 86 percent sold their produce (Table 6). Production and marketing of cotton are prominent in the Lubombo region, where 90 percent of the producers sell their crop. The marketing of maize has, until recently, been under close control of the National Maize Corporation. However, recent moves towards liberalization have included a flexible price policy aimed at encouraging farmers to store their grain for sale during periods of scarcity. A very minimal proportion of the maize-producing households (5 percent) sold their crop. This trend is similar to that of all the other crops produced by the households. These include sweetpotato (5 percent), groundnut (3 percent), Irish potato (3 percent), and cowpea (2 percent).

Although subsistence agriculture provides the principle livelihood of the majority of the population in Swaziland, it is characterized by low productivity. This has implications on the households' food security situation as they need to supplement their own produce with food bought from the market. Rice production is minor in Swaziland, as it is difficult for locally produced rice to compete against imports. Reasons for this include the poor availability of water due to the constant droughts hitting the country. This is evident from the large proportion of households that bought rice in the study area (99 percent)(Table 7).

Similarly, maize and the majority of the major crops grown by the households were bought by large proportions of the sampled households. There are very little variations across the regions. However, soybean and tobacco were bought by households in Manzini; millet and pigeon pea were bought only by households in Lubombo.

Table 8 summarizes the proportion of households that bought and also sold their produce. This could be attributed to seasonality of the crops, whereby households have to buy food during the lean agricultural periods and they sell their crop at harvest if they have a surplus. This was however practiced by very few households.

Self-sufficiency in the production of basic foodstuffs continues to be a national objective which is encouraged and pursued by the Government with due consideration to conservation and the development of water and soil resources. One of the main effects of HIV/AIDS at the household and community levels is food insufficiency (Masuku 2006). Because of the reduced availability of labor, households are unable to produce enough food to sustain their livelihood. About 66 percent of the population is unable to meet basic food needs (IFAD 2007). Among others, one of the plans by the Swaziland Government has been to empower the poor to generate a substantial income through a judicious mix of policies and programs. The measures are to enable the poor to increase production and meet their basic needs while progressively graduating to self-sufficiency and commercialization. The increase in the productivity of the poor will benefit not only the poor but also the economy as a whole by raising their purchasing power and the effective demand for goods and services in other sectors (MEPD 2006).

**Table 7. Proportion of households that bought crops (%).**

Crop	Region			All
	Hhohho	Lubombo	Manzini	
Rice	100	99	100	99
Irish potato	76	99	99	95
Tomato	100	91	97	95
Beans	89	98	94	95
Maize	80	86	78	82
Groundnut	96	85	72	81
Amaranthus	0	100	67	80
Sweetpotato	90	82	73	79
Paprika	100	86	38	71
Sorghum	100	55	79	68
Cassava	0	58	40	55
Cowpea	75	45	42	44
Sesame	0	25	67	43
Pumpkin	48	26	42	37
Soybean	0	0	50	33
Tobacco	0	0	50	33
Millet	0	25	0	20
Pigeon pea	0	20	0	17

**Table 8. Proportion of households that bought and sold crops in Swaziland (%).**

Crop	Region			All
	Hhohho	Lubombo	Manzini	
Cassava	0	4	0	3
Groundnut	0	2	2	2
Pumpkin	0	0	2	1
Maize	0	0	1	1
Tomato	0	1	1	1

**Table 9. Self-sufficient producers of major crops in Swaziland (% of households).**

Crop	Region			All
	Hhohho	Lubombo	Manzini	
Vegetables	100	88	92	92
Pumpkin	48	67	52	57
Cowpea	25	50	50	49
Cassava	0	27	40	29
Sorghum	0	36	19	27
Pigeon pea	0	20	0	17
Sweetpotato	7	14	19	16
Groundnut	4	12	22	15
Maize	19	10	16	14
Sesame	0	25	0	14
Cotton	0	5	0	5
Paprika	0	7	0	4
Beans	8	2	5	4
Tomato	0	5	1	2
Irish potato	6	0	1	1
Sunflower	-	-	100	100
Yam	100	-	-	100

**Table 10. Major buyers of crops in Swaziland (% of households).**

Buyer	Region			All
	Hhohho	Lubombo	Manzini	
Consumer/other farmer	52	63	80	68
Rural assembler/middlemen/trader	44	9	16	16
Processors	0	21	3	11
Farmers' union/cooperative	4	7	0	4
Government/parastatal	0	0	2	1

Despite the fact that maize is the most important crop in the country, self-sufficiency in maize was achieved by only 14 percent of the households (Table 9). Self-sufficiency in vegetables on the other hand, was reported by 92 percent of the households.

### Major buyers of crops

Smallholder farmers in Swaziland face obstacles on both the production and market sides of their businesses. Yields are depressed by a lack of quality inputs, depleted soils, and outdated practices, and farmers often have difficulty in finding stable markets that will offer fair prices for their crops. The high proportion (68 percent) of households that sold their produce directly to consumers or other farmers indicates an underdeveloped market infrastructure in the area since farmers cannot enjoy the benefits, such as high prices and bulk sales, that they would get from selling to Government organizations, parastatals, and farmers' cooperatives (Table 10). In addition, 16 percent of the farmers sold to middlemen, despite receiving reduced prices. This is most frequent in Hhohho.

There is therefore a need to improve market infrastructure and encourage cooperative societies and associations to enable the pooling of productive resources, scale economy, and improved bargaining for the reduction of input prices and better selling prices.

### Mode of transport for marketing of crops

Agriculture production is severely constrained by the lack of wheeled transport with the result that most farmers have to carry farm inputs and produce on their heads. This is not conducive to efficient farming as farmers frequently cannot carry their produce as head-loads to the market. In a study of 391 development practitioners in the field of agricultural development, Henson et al. (2008) found that impediments to smallholders' participation in higher-value production markets all had to do with infrastructure, and included poor rural transport infrastructure, the high cost of transport services, and a weak marketing infrastructure. Unlocking smallholder farmers' market access through improved transportation can lift many families out of poverty. Farmers can contribute to better food supply if they have, among other things, roads and transportation to get their products to markets.

The most common mode of transport used for the marketing of farm produce is public transport, as indicated by 43 percent of the households (Table 11). This is evident across all the regions. About one-quarter of the households reported carrying their produce as head-loads to the market.

**Table 11. Mode of transport used for marketing (% of households).**

Transport	Region			All
	Hhohho	Lubombo	Manzini	
Public transport	50	42	42	43
Head-load	19	29	25	26
None (farm gate)	20	5	30	18
Hired truck	0	1	1	1

# Technology Preferences and Adoption

Technologies play an important role in economic development. In view of the considerable potential for increasing food production through the generation and use of new agricultural technology, many developing countries have invested in agricultural research and extension.

## Farmers' preferences

Farmers' preferences and circumstances play a large role in influencing farmers' decisions to adopt or increase the use of modern varieties. Low adoption has sometimes been attributed to the modern varieties lacking the characteristics valued by farmers. Researchers therefore need to understand the traits of varieties preferred by farmers to develop appropriate technologies, and for policymakers to design and execute the most effective policies for promoting improved varieties and technologies.

As indicated (Table 12), different traits are preferred for different crops. For instance, the traits most preferred for maize are drought tolerance, high starch content, and earliness of maturity. On the other hand, farmers prefer pest and disease resistance in soybean and cowpea varieties. Grain/root color is the most important trait in sweetpotato varieties; grain/root size is the most preferred trait in cassava varieties. Good taste is also an important trait in all the other crops.

## Sources of information on improved crop varieties

For farmers to adopt new and improved crop varieties, knowledge of the varieties is a prerequisite. Awareness of technologies and their potential is a crucial stage towards the making of adoption decisions by farmers (Manyong et al. 2008). However, this on its own is not sufficient to ensure adoption. Radio and television are the most common media through which households in the study area obtained information on modern crop varieties. This was reported by about one-third of the households (Table 13).

**Table 12. Most preferred traits for major crops (% of households).**

Trait	Crop				
	Maize	Cassava	Soybean	Cowpea	Sweetpotato
Earliness of maturity	51	6	6	19	18
Yield	30	12	6	22	28
Pest and disease resistance	20	7	30	34	8
Drought tolerance	56	9	5	17	13
Taste	11	15	11	30	32
Grain/root color	3	12	3	22	60
Grain/root size	39	21	6	15	20
Starch content	54	5	0	15	26

**Table 13. Source of information on modern varieties (% of households).**

Service	Region			All
	Hhohho	Lubombo	Manzini	
Radio/TV	40	21	31	29
Extension agent	8	17	9	12
Neighbor/other farmers	10	9	8	9
NGOs	0	9	6	6
Seed traders/Agrodealers	4	0	2	2
Farmers' cooperatives or groups	0	3	1	2

**Table 14. Adoption of improved varieties of major crops (% of households).**

Crop	Region			All
	Hhohho	Lubombo	Manzini	
Maize	69	84	84	81
Cowpea	23	51	51	46
Sweetpotato	26	27	32	30
Cassava	0	18	3	8
Soybean	6	15	0	5

A smaller proportion of households (12 percent) acquired information on modern varieties from extension agents working in their communities. Social cohesion among farmers plays an important role in development progress in rural areas. Farmers are able to share information on new and improved technologies with others. In the study area, 9 percent of the households reported that they obtained such information from their neighbors and other farmers in the area. Other sources of information on improved varieties include NGOs, seed traders, agrodealers, and farmers' cooperatives or groups.

### **Adoption of improved crop varieties**

Low adoption of improved varieties has been put forward as one of the reasons for low productivity and yield. Crop yields in developing countries are often many times lower than those that could be achieved using readily available technologies and farming techniques, and food security can be a serious problem. Agricultural incomes and food security can depend on farmers' adoption of these tools and techniques. However, despite their bringing about significant increases in agricultural productivity and growth, there has been some variation in the extent to which households have benefited from improved varieties. Production risk is a major source of income fluctuations for rural households involved in agricultural activities, especially in developing countries. Because high-yielding varieties are more profitable but also more risky, households unwilling to bear consumption fluctuations may decide not to adopt (Gine and Yang 2007).

The adoption rate for improved maize varieties is higher than that for all the other major crops grown by the sampled households (Table 14). Eighty-one percent of the households indicated that they planted improved maize varieties in the 2011/2012 cropping season. This is a good development, as enhanced adoption of improved varieties (such as drought-tolerant varieties) can help to increase maize production and thus improve the food security situation in Swaziland.

About half of the households grew improved cowpea varieties while the adoption rate for improved sweetpotato varieties is 30 percent. Improved cassava and soybean varieties have much lower adoption rates. For most of the major crops grown, adoption rates are higher in Manzini and Lubombo than in Hhohho. However, none of the households in Manzini grew any improved soybean varieties.

### **Reasons for non-adoption of improved crop varieties**

New crop varieties often have been promoted in developing countries based upon superior yield vis-a-vis locally available varieties (Dalton 2003). However, farmers tend to be risk averse and therefore try to derive utility from both improved and local varieties instead of focusing only on new varieties. In addition, farmers' preferences change over time and so a newly released variety may not necessarily be superior to the varieties already existing on the ground. This may contribute to the low rate of adoption of new and improved varieties. Lack of funds to purchase seeds and scarcity of the seeds themselves are reported as the main barriers to the adoption of improved crop varieties (Table 15). This may imply that high prices render farmers unable to purchase the improved seeds. Farmers therefore need interventions that can strengthen their purchasing power. This may include the creation of diverse off-farm opportunities in the local communities.

**Table 15. Reasons for the non-adoption of improved varieties of major crops (% of households).**

Crop/Reason	Region			All
	Hhohho	Lubombo	Manzini	
<b>Maize</b>				
Lack of seeds	13	6	9	8
Lack of cash for seeds	18	18	15	17
Lack of land	10	1	6	5
Local varieties are better	2	3	2	2
<b>Cassava</b>				
Lack of seeds	0	8	1	3
Lack of cash for seeds	0	1	0	0
Lack of land	0	0	0	0
Local varieties are better	0	4	0	1
<b>Soybean</b>				
Lack of seeds	6	4	1	2
Lack of cash for seeds	0	2	0	1
Lack of land	0	0	0	0
Local varieties are better	0	0	0	0
<b>Cowpea</b>				
Lack of seeds	19	20	22	21
Lack of cash for seeds	2	8	6	6
Lack of land	0	0	0	0
Local varieties are better	0	2	1	1
<b>Sweetpotato</b>				
Lack of seeds	11	10	15	13
Lack of cash for seeds	4	5	4	4
Lack of land	0	0	0	0
Local varieties are better	0	2	0	1

# Poverty and Household Welfare

## Household income

Household income is the aggregation of income both in cash and/or in kind that accrues from the economic activities performed by household members on a regular basis. The assessment of the distribution of income by source may act as an important targeting tool by policymakers. The average annual household income in the study area is US\$739 per capita. Households in Hhohho have the highest income of US\$1368 per capita and those in Lubombo have the lowest (US\$425 per capita). This is increasingly based on the cash economy rather than the subsistence economy, which means not only the marketing of livestock, cash crops, and surplus cereals, but on casual and formal employment, as well as remittances which bring an important part of the total income of most of the rural population (SVAC 2007).

## Crop income

Household agricultural activities are a major source of livelihood in Swaziland. Results in Table 16 indicate that across the sampled regions, 87 percent of the households engage in farming as the primary occupation. This emphasizes the concept that households sell cash crops and surplus cereals for an income.

In this study, the gross value of production measures the total value of output from agriculture per unit of land. It was compiled by multiplying gross production in physical terms by output prices at prevailing market prices and dividing it by the amount of land used for agricultural activities. Thus, value of production measures production in monetary terms at the market price level/ha. Gross value of agricultural production is essentially an ex-farm value of the production estimate, and as such, does not include any multiplier effects associated with agriculture—including downstream processing and manufacturing. Results indicate that households in Lubombo had the highest gross value of production of US\$178/ha. There is some variation across the regions, with Hhohho having the lowest gross value of production of US\$115/ha. This could be attributed to regional differences in productivity as well as to differences in input and output prices. The average gross value of production for all the sampled regions is US\$152/ha.

To determine the net returns from production accruing to the farmers, costs (both fixed and variable) have to be incorporated. These include monetary values of all inputs of production used, such as seeds, fertilizer, manure, purchased chemicals, both hired and family labor. Consistent with the household gross value of production, households in Lubombo accrued the most returns from crop sales. The average net returns for all the sampled regions is US\$140/ha.

**Table 16. Income strategies and outcomes in Swaziland.**

Strategies/Outcomes	Region			
	Hhohho	Lubombo	Manzini	All
Farming as primary occupation (%)	86	86	90	87
Household income (US\$/capita/year)	1368	425	751	739
Gross value of production (US\$/ha)	115	178	138	152
Net returns (US\$/ha)	101	169	125	140
Off-farm employment (%)	99	93	95	95
Remittances	45	50	58	52
Unskilled wage labor	39	52	42	45
Petty trade	33	30	42	35
Drought relief (food aid)	6	46	26	30
Skilled wage labor	43	17	31	28
Artisan/handicraft	25	21	25	23
Food for Work	5	26	14	17

## **Off-farm activities and income**

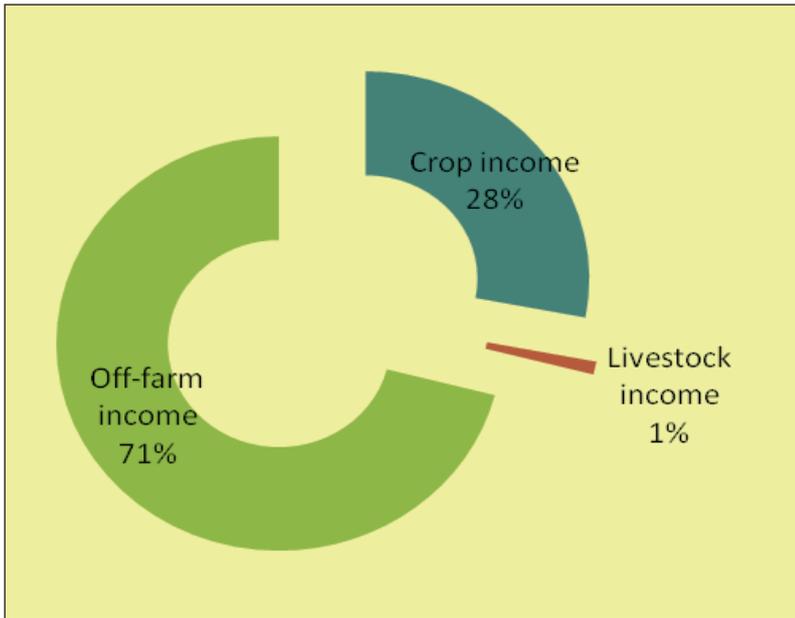
Although their livelihoods mainly depend on subsistence farming, livestock, and herding, the rural population has diversified its income sources, ranging from employment in the formal sector to petty trade and seasonal casual labor (SVAC 2006). The diversification of household activities is a key factor in household food security. Farm households diversify their income sources by working off the farm. This is a risk management strategy that is used by farm households in both developed and developing countries. Income diversification via off-farm work is associated with higher incomes and food consumption (Chang and Mishra 2008). Diversified households are said to be more likely to enjoy a higher capacity for flexibility and resilience than households that are completely dependent on agriculture. Furthermore, the perceived advantages of livelihoods diversification are increasingly becoming important in the light of reiterated environmental, economic, and political shocks affecting the rural areas of developing countries (Simtowe 2009). Although there is a widespread traditional image that farm households in developing countries focus on farming and undertake very little rural non-farm activities, rural non-farm income is also an important resource for farm and other rural households, including the landless poor and rural town residents (FAO 1998).

Rural non-farm income refers to the earned and unearned income received by rural people from non-agricultural activities. The most common sources of this income include remittances and non-farm activities based in rural areas. Employment is one of the main sources of income for most people and therefore the statistics on employment and its related statistics are major factors in the formulation and evaluation of policies that effect income generation, reduction of poverty, and the income situation of the working population. According to CSO (2008), four in ten women aged 15–49 years are employed while about half of the men in the same age group are employed in Swaziland. This indicates a high level of off-farm activity among the population.

Consistently, almost all of the households in the study area are engaged in off-farm employment (Table 16). This implies that the majority of the sampled households rely on income from off-farm employment to sustain their livelihoods. Hhohho has the highest proportion of households that have off-farm employment (99 percent). Other sources of non-farm income include remittances, unskilled wage labor, petty trade (e.g., retail shopkeeping and vending), Drought Relief in the form of food aid, skilled wage labor, artisan/handcraft, and public works programs, such as Food for Work). Remittances play a large role in supporting livelihoods in rural Swaziland (SVAC 2006). A significant proportion of the households (52 percent) receive remittances, mostly from family members who migrate to the Republic of South Africa in search of employment opportunities. It is mainly the male members of the households who migrate. According to Mabuza et al. (2008) cereal food aid deliveries have in the past production seasons featured prominently in the coverage of Swaziland's maize gap, following the Government's appeal to the international community to assist in mitigating the impact of drought on the country's food production. About one-third of the households in the study area indicated having received Drought Relief in the form of food aid.

## **Income shares**

Figure 5 provides information on household income portfolios. These provide a concise picture of livelihood strategies in the study area. As 95 percent of the households are engaged in some form of off-farm employment, it is unsurprising that off-farm income accounts for most of their total household income (71 percent). Livestock on the other hand has the smallest share of income to the total income. This could be attributed to the concept of wealth attached to the number of livestock owned. To maintain their social status, owners would therefore be unwilling to sell their livestock unless faced with livelihood shocks. Off-farm income therefore plays a very important role in the livelihoods of the sampled households and this is evident across all the regions. The majority of rural people depend on cash income for survival, especially when prolonged dry spells and erratic rains are experienced (SVAC 2006).



**Figure 5. Household income shares in Swaziland.**

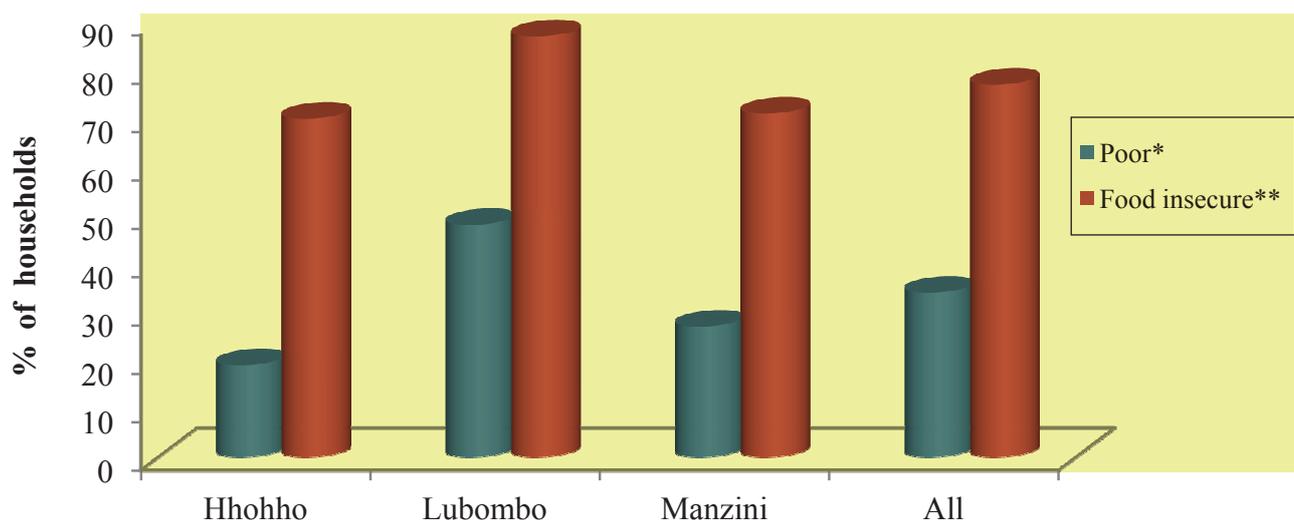
Disaggregated by region, households in Lubombo (36 percent) and Manzini (28 percent) derive significantly higher proportions of their income from crop sales than households in Hhohho. On the other hand, households in Hhohho have higher shares of off-farm income.

### Poverty profile

Poverty is a multidimensional concept encompassing numerous aspects of well-being. The World Bank defines poverty as “the inability to retain a minimal standard of living, measured in terms of basic consumption needs or some income required for satisfying them”. The dominant Western definition since World War II has defined poverty in monetary terms, using levels of income or consumption to measure poverty (Grusky and Kanbur 2006) and defining the poor by a headcount of those falling below a given income/consumption level or “poverty line” (Lipton and Ravallion 1993).

Besides suffering from acute material poverty, the poor in Swaziland also suffer from a high degree of vulnerability to HIV/AIDS, natural disasters, and economic shocks. The Consumer Price Index profile for low-income groups indicates that the poor spend most of their income on food and the prices are rising very fast. They also do not have reliable sources of income. They are usually employed as laborers and seasonal employees with very low wages (MEPD 2006). Poverty in Swaziland is driven by the persistent drought that has caused famine in many rural communities. In addition, the loss of income earnings through retrenchment and general unemployment that has sky-rocketed contributes to the lack of access to productive resources by the poor. The scourge of HIV and AIDS has also intensified poverty through the loss of earnings from breadwinners in families.

According to Ngwira (2010), female-headed households are poorer than male-headed households in terms of income and more often they have fewer means of moving out of poverty. In addition, they have lower access to inputs, credit, extension services, and land. In Swaziland, women are particularly vulnerable to poverty. Constitutionally, women can own and control land and their finances. However, traditional social systems discriminate severely against them and often bar them from owning and controlling land. In rural areas, women have less access to education (IFAD 2007). In the context of an agriculture-based economy, these in general lead to female-headed households being poorer than those headed by men.



**Figure 6. Household poverty and food security in Swaziland.**

\*Poverty line = SZL 1832 /capita/year (equivalent to US\$1.25/capita/day at purchasing power parity exchange rate).

\*\*Subjective self-assessment of own food security as perceived by the head of households.

In practice, no one indicator can capture all its dimensions. Nevertheless, measures of poverty are routinely constructed to help policymakers and researchers understand the poor. One such indicator is the poverty line, defined as the threshold level of welfare that distinguishes poor households from those that are non-poor. In this study, the poverty line was calculated to be SZL1832/capita/year which is an equivalent of US\$1.25/capita/day at the purchasing power parity exchange rate. About one-third of the households live below the poverty line (Fig. 6). This is consistent with the national proportion (41 percent) of the population living under the US\$1.25/capita/day poverty line in 2010 (WDI 2012). The incidence of poverty is highest in Lubombo, which is one of the poorest regions of Swaziland.

Swaziland is experiencing rising food insecurity, with an estimated 21 percent of the population considered to be food insecure (OECD 2012). Figure 6 shows that in the study area, about three-quarters of the households reported they were food insecure. A majority of the population of Swaziland relies on subsistence farming. This can mean that, at times, crops and/or livestock are barely sufficient to provide food for farmers and their families, with little or no surplus left over for sale. As a result, households remain vulnerable to food insecurity (IFRC and RSC 2006).

### **Determinants and correlates of poverty**

Poverty is a multifaceted phenomenon which affects not only the ability to purchase goods, but also vulnerability to various pressures that may prohibit an individual from enjoying life. This vulnerability may be gauged from living conditions, such as employment, health, education, and housing. It is important to monitor inter- and intra-household differences in poverty, vulnerability, and living conditions, and also to understand the causes of these differences, in order to prepare strategies for more efficient intervention schemes aimed at poverty reduction. The measurement and analysis of poverty, inequality, and vulnerability are crucial for cognitive purposes (to know what the situation is), for analytical purposes (to understand the factors determining this situation), for policymaking purposes (to design interventions best adapted to the issues), and for monitoring and evaluation purposes (to assess the effectiveness of current policies and to determine whether the situation is changing) (Coudouel et al. 2002).

### **Empirical results**

The logit maximum likelihood estimates and marginal effects are presented in Table 17. Marginal effects from the logit model provide a good approximation of the amount of change in the dependent variable produced by a unit change in each explanatory variable while holding all other factors constant. The marginal effects were

**Table 17. Logit model estimates of the determinants and correlates of poverty in Swaziland.**

Variable	Coefficient estimate	T-ratios	Marginal effects	% change in probability of being poor
Constant	0.609	0.73		
Gender of household head (1=Male; 0=Female)	-0.040	-0.20		
Age of household head (years)	0.000	0.03		
Education of household head (years)	-0.079****	-3.55	-0.014	1.4
Household size	0.097***	3.22	0.018	1.8
Dependency ratio (child/adult)	0.090	0.70		
Orphans (1=Yes; 0=No)	0.364*	1.84	0.066	6.6
Sick household members (1=Yes; 0=No)	0.153	0.79		
Log value of farm assets (SZL)	-0.214***	-2.89	-0.039	3.9
Livestock ownership per capita (TLU)	-0.360**	-2.44	-0.065	6.5
Cultivated land per capita (ha)	-0.542**	-1.99	-0.279	28
Off-farm income share in total household income	-0.372	-1.08		
Access to credit	0.022	0.11		
Access to extension services	-0.663*	-1.72	-0.120	12
<b>Location</b>				
Lubombo	1.036****	3.51	0.192	19
Manzini	0.345	1.17		
<b>Goodness of fit tests</b>				
Hosmer-Lemeshow chi-squared (634)	627.18			
Likelihood Ratio chi-squared(15)	98.99****			
Pseudo R-squared	0.16			
Correct prediction	73%			

\*\*\*\* $P < 0.001$ , \*\*\* $P < 0.01$ , \*\* $P < 0.05$ , \* $P < 0.1$ .

computed only for the significant variables in the model and converted into percentages. Goodness-of-fit tests were carried out to determine the strength of the model. Likelihood Ratio chi-squared value is highly significant, indicating that the model is a good fit of the data. In addition, the percentage of correct predictions is also high (73 percent). All significant coefficient estimates of the explanatory variables have the expected signs.

The probability of being poor is reduced by 1.4 percent with each additional year of schooling for the household head. This implies that households headed by individuals with 10 more years of formal education than the education level of an average household head are 14 percent less likely to live below the national poverty line. The size of the household is highly correlated with the poverty status of the household. Results from the logit model indicate that, holding all other factors constant, an additional household member increases the probability of the household being poor by 1.8 percent. Similar results are reported in an analysis of the determinants of regional poverty in Uganda, whereby the education level of the household head and size of household are among the significant determinants of poverty (Okurut et al. 2002).

As in most developing countries, the HIV and AIDS pandemic in Swaziland mirrors the conditions of poverty. Households looking after orphans have a 6.6 percent higher probability of being poor compared to those not looking after orphans. Households that are vulnerable and hosting orphans should therefore be assisted through policy interventions, such as agricultural, Food Aid, and rural development policies so they can maintain their agricultural production and food security (Masuku and Sithole 2009). These ultimately prevent them from resorting to negative coping strategies, such as selling household assets and livestock, which creates a vicious cycle of poverty from which households are unable to break out of.

Agriculture has the potential to reduce poverty in low-income countries like Swaziland since a large proportion of the population engages in agriculture, mainly for subsistence needs. Farm assets including farm tools and equipment constitute important capital in farming. Results show that households in possession of these items are about 4 percent less likely to be poor than those that do not own any agricultural assets. The coefficient for the land area cultivated suggests that poverty would be reduced by increasing the per capita acreage cultivated, if it were feasible to do so. We find that an increase in cultivated area per capita by one acre reduces the likelihood of being poor by 28 percent. Access to agricultural land, through agricultural production, is one of the important factors that can translate into growth from poverty. Similarly, households with a livestock unit more than the average household are 6.5 percent less likely to be poor than the average household. Mukherjee and Benson (1998) reported household welfare gains from increases in the per capita acreage cultivated and the value of livestock. Access to agricultural assets, through agricultural production, is therefore one of the important factors that can translate into growth out of poverty.

Increased agricultural production also depends on the provision of infrastructure, such as extension services, among others. Through extension services, farmers are encouraged to diversify their crops and maximize land use by concentrating on what they can produce best so as to realize maximum returns. In a study to assess the determinants of poverty among fish-farming households in Nigeria, Amao et al. (2009) found an inverse relationship between contact with an extension agent and the level of moderate poverty. This supports the results from this analysis, which indicate that households that had contact with extension officers are 4 percent less likely to be poor.

Positive coefficient estimates on location variables indicate that households in both Lubombo and Manzini have a higher probability of being poor than those in Hhohho, the region of reference in this analysis. However, this probability is significant only in Lubombo. This lends strong support to the descriptive result showing that Lubombo has the highest incidence of poverty (48 percent) and that it is one of the poorest regions in Swaziland.

### **Household livelihood dynamics**

Household livelihoods change over time due to various inter- and intra-household factors. Table 18 illustrates household livelihood dynamics over the past 10 years. Land is one of the most important factors of production in Africa. According to Roth and Haase (1998), farmers are more likely to make medium- to long-term improvements if their tenure has security rights. More than half of the households in the study area reported that cultivated land had decreased over the past 10 years. Reasons for this change include drought, which causes land to be uncultivable as there is no water for irrigation, lack of money for the purchase of tractors and other farm machinery, and also lack of money for the purchase of more land for cultivation.

Non-farm, income-generating activities are an important complementary source of household income since crop income is prone to risks and fluctuations. Most smallholders are vulnerable to economic and climatic shocks and spread their risk by diversifying their sources of livelihood, often including significant off-farm, income-generating activities. This is emphasized by 51 percent of households reporting that their engagement in off-farm activities has increased over the past 10 years. Farmers cite inconsistencies in farm production as the main reason for this change.

Household size, on the other hand, has increased over the past 10 years in the study area, as reported by 60 percent of the sampled households. This has negative impacts on household welfare as it increases the dependency ratio, thereby putting a strain on household resources if the new additions are economically inactive. This is in line with the increase in the human population across all the study regions. This increase is caused by the high birth rate and an increase in the number of children orphaned by HIV/AIDS and therefore adopted into households. Similarly, 41 percent of the households indicated that the number of sick people in the household had increased over the past 10 years while 38 percent reported no change. This is mainly attributed to illnesses related to HIV/AIDS.

**Table 18. Household livelihood dynamics over the past 10 years (% of households).**

	Region			All
	Hhohho	Lubombo	Manzini	
<b>Cultivated land</b>				
Increased	10	10	8	9
Decreased	51	58	46	52
No change	39	31	46	38
<b>Non-farm activities</b>				
Increased	54	39	62	51
Decreased	25	26	19	23
No change	20	35	19	26
<b>Household size</b>				
Increased	60	61	59	60
Decreased	26	24	28	26
No change	13	14	13	14
<b>Sick people</b>				
Increased	37	43	41	41
Decreased	18	19	24	21
No change	45	37	35	38

## Household shocks and coping strategies

Household welfare can be affected by shocks, such as drought, death of a household member, and a poor harvest due to pests and diseases. These can lead to income effects, loss of assets, or both. The degree to which households are vulnerable to different shocks depends on their relative reliance on economic options that are directly or indirectly affected by the shock. In this sense, the effects of hazards are a direct corollary of the importance of different sources of food and cash income. People's risk of food and livelihood insecurity is therefore a function of the magnitude of the shock they experience, their vulnerability to the shock, and their capacity to respond (Boudreau 2010).

In this regard, households were asked their perception of their economic well-being (Table 19). Half of the households reported that, from a year prior to the interview, their economic well-being had become worse-off. This trend is consistent across the study regions. Some of the reasons cited for this are the lack of employment opportunities and a reduction in household income due to the illness of productive household members. The households, however, have a positive outlook on their future, only if such constraints are eradicated through the creation of viable employment opportunities, and, by extension, support to skilled labor and education enhancement. Besides suffering from acute material poverty, the poor in Swaziland also suffer from a high degree of vulnerability to HIV/AIDS, natural disasters, and economic shocks (MEPD 2006). As indicated by 50 percent of the households, poor harvests due to drought are the major shocks affecting household well-being (Table 19). Although drought has hit the country for the past 15 years, no policy has been formulated to deal with the problem (Salam and Mamba 2012), making households more vulnerable.

Households also faced labor shortages due to death or illness of household heads or members. According to the United Nations (2012), rising food prices and reduced income from labor brought on by the fiscal crisis were the main economic shocks that hit households in Swaziland in 2011. These can severely affect poorer households and vulnerable groups such as female-headed households and households with members living with HIV/AIDS.

**Table 19. Sources of welfare shocks and trends of economic well-being (% of households).**

	Region			All
	Hhohho	Lubombo	Manzini	
<b>Changes in economic well-being from a year ago</b>				
Worse-off	42	50	55	50
Better-off	31	26	25	27
Same	27	24	19	23
<b>Expected economic well being a year from now</b>				
Better-off	46	53	54	52
Same	37	25	24	27
Worseoff	18	20	21	20
<b>Source of shock</b>				
Poor harvest due to drought	7	69	52	50
Rising food prices	63	8	23	25
Labor shortage due to death of household head	4	7	5	7
Labor shortage due to sickness of household head	4	5	9	5
Poor harvest due to pests and disease	8	2	4	4
Sickness of household member	5	3	1	4
Labor shortage due to death of household member	4	4	5	3
Falling crop prices	3	0	1	1
<b>Coping strategy</b>				
Switching to drought-tolerant crops	6	48	38	36
Diversifying income sources into non-farm activities	39	19	24	25
More savings and less expenditure	39	12	23	22
Piece work	4	10	6	7
Switching to labor-saving crops	7	4	4	5
Adopting improved varieties resistant to pests and disease	5	4	5	5

Households turn to various coping strategies in times of such stress (Table 19). The choices that households make in terms of option and the degree of success they will have depend on the nature of the shock. Adoption of drought-tolerant crop varieties is one of the major coping strategies households prefer to use in dealing with poor harvests due to drought. On the other hand, households diversify their income sources into non-farm activities, such as piece work and self-employment, and they also reduce expenditure on non-essential items to increase household income.

# Community Analysis

## Public support services

The study collected information on the infrastructure available in communities in the study area. This includes public services and the various coping strategies communities have adopted to mitigate the impact of HIV/ AIDS on livelihoods.

## Community infrastructure and services

The 2006 Swaziland Poverty Reduction Strategy and Action Program stated rural development was a major priority, capable of stimulating agricultural and other non-agricultural activities which would provide opportunities for generating incomes and broad-based growth (MEPD 2006). Increased production and the successful implementation of a rural development program depend on the provision of infrastructure: extension services, technology, markets, social services, and financial services.

The fundamental role of education for poverty reduction is recognized universally. Access to education contributes directly to human development by improving capacities and opportunities empowering people, and thus promoting greater social integration and gender equality. It is also widely acknowledged that information is power and an indispensable means of improving the living conditions and standards of all people (MEPD 2006).

Primary schools are found in all the communities in the study but; secondary schools are found in only half of them (Table 20). This entails better access to basic education in the communities. The average distance to the nearest secondary school located outside the communities is 2.4 km. The nearest health facility is however twice as far away. Communities in Hhohho reported that they had no nearby clinics and secondary schools. This is an indication that interventions aimed at improving the health situation in the study area are required, especially in the face of the rampant HIV/AIDS pandemic. People in rural Swaziland generally have large families with four or more children; this creates health and nutrition issues as the poverty rate makes it difficult to maintain adequate amounts of food, water, and medicines.

About 70 percent of the communities reported that they had access to boreholes and well water. Though there are many river systems and many borehole and wells dug throughout Swaziland, many of them are unusable because of seepage from raw human sewage and non-point sources of contamination. This means that people need to

**Table 20. Availability of community infrastructure and services.**

Infrastructure and services	Availability (% of communities)				
	Hhohho	Lubombo	Manzini	Shiselweni	All
Primary school	100	100	100	100	100
Secondary school	0	50	100	0	50
Health clinic	0	17	50	100	30
Borehole/well water	100	67	50	100	70
Electricity	100	83	100	100	90
Mobile phone reception	100	100	100	100	100
Extension services	0	33	0	100	30
Credit facilities—formal (e.g., banks)	0	0	0	100	10
Credit facilities—informal (e.g., moneylenders)	0	50	50	0	40
Credit facilities—NGOs	0	17	50	100	30
Output market (e.g., for fresh cassava, <i>gari</i> , etc.)	0	17	0	100	20
Fertilizer market (agrodealer shops)	0	0	0	0	0
Seed/planting material market (agrodealer shops)	0	0	0	0	0
Paved/gravel road to the main town	100	67	50	100	70
Tarred road to the main town	100	50	100	0	60
Motorized transport to the main town	100	83	100	100	90

walk miles each day to get enough buckets of water for use (Powell 2011). Consistently, the mean distance to the nearest borehole outside the communities is 1.8 km.

One interesting finding is the complete absence of markets for fertilizer and seeds/planting material (agrodealer shops) in the communities under study across all the regions. On average, the nearest markets are about 14 and 18 km from the communities. Market fragmentation—inadequate institutional and infrastructural linkages (e.g., railways, roads, and telecommunications)—means that markets are poorly integrated over both space and time. This affects physical markets and reduces the access of producers and traders to information that signals price changes and limits their ability to change their patterns of production and trade to avoid economic shocks (Handley et al. 2009). Enhancing farmers' proximity to marketing points is one effective way of improving their access to markets. Government intervention is therefore required to ensure that all stakeholders participate in the development of infrastructure, including markets and road networks.

### **Access to credit**

Lack of access to productive capital has been widely accepted as one of the major causes of poverty in developing countries. This is due to the fact that formal financial institutions mostly exclude the poor in their lending activities. Many developing countries have therefore adopted the strategy of promoting access to credit facilities by establishing Government-owned Agricultural Banks and promoting NGOs that offer credit to the poor (Chirwa 2002). Despite their need for credit access, the provision of financial services remains limited for rural households. Inherent risks associated with the agricultural sector, high transaction costs, operational inefficiencies, and the absence of effective Government policies have hindered the growth of microfinance in many African countries (Dooner 2007).

According to Zeller et al. (1997), access to credit affects household welfare outcomes through three pathways: first by providing capital for financing inputs, labor, and equipment for income generation; secondly by increasing a household's risk-bearing ability and by altering its risk-coping strategy; and thirdly, by efficiently stabilizing the consumption of food and other essential goods. The role of credit in agricultural production is crucial because inputs, such as seeds and fertilizers, are purchased at the beginning of the production season, but returns are realized only at the end of the season (Masuku 2009).

Credit requirements of the farming sector in Swaziland have increased rapidly over the past few decades as a result of the rise in use of fertilizer, improved seeds, and mechanization, and the hike in their prices. In a study to analyze the contribution of savings and credit cooperatives to food production in Swaziland, Mavimbela et al. (2010) found that savings and credit cooperatives play an important role in improving agricultural production. Farmers therefore need to be encouraged to join and save with cooperatives in order to have access to microfinance and improve their production through the use of improved seeds, technology, and fertilizers.

Diagne (1998) distinguishes access to credit from participation in credit programs as follows: a household has access to a particular source of credit if it is able to borrow from that source though it may choose not to borrow, whereas a household participates if it borrows from a source of credit. This study focuses on households that borrowed from credit facilities in the area. About half of the households (54 percent) reported borrowing credit. Credit was borrowed by more households in Lubombo (55 percent) and least in Hhohho (36 percent).

The credit was borrowed and used for various purposes. As illustrated (Fig. 7) households mainly borrowed credit for the purchase of food (24 percent) followed by 19 percent who needed credit for payment for children's education. Agricultural credit was used by a limited proportion of households: 13 percent purchased seeds/planting material; only 6 percent used it for the purchase of fertilizer. Other uses of credit include family health (16 percent) and investments in businesses or trade (14 percent). This indicates that, in Swaziland, consumption credit in the form of cash or food is more important among those that obtain credit.

### **Farmers' groups and social capital**

The concept of social capital has become popular in many disciplines including rural development. Due to its increasing popularity, several definitions have been generated. According to Fukuyama (1997), social capital can

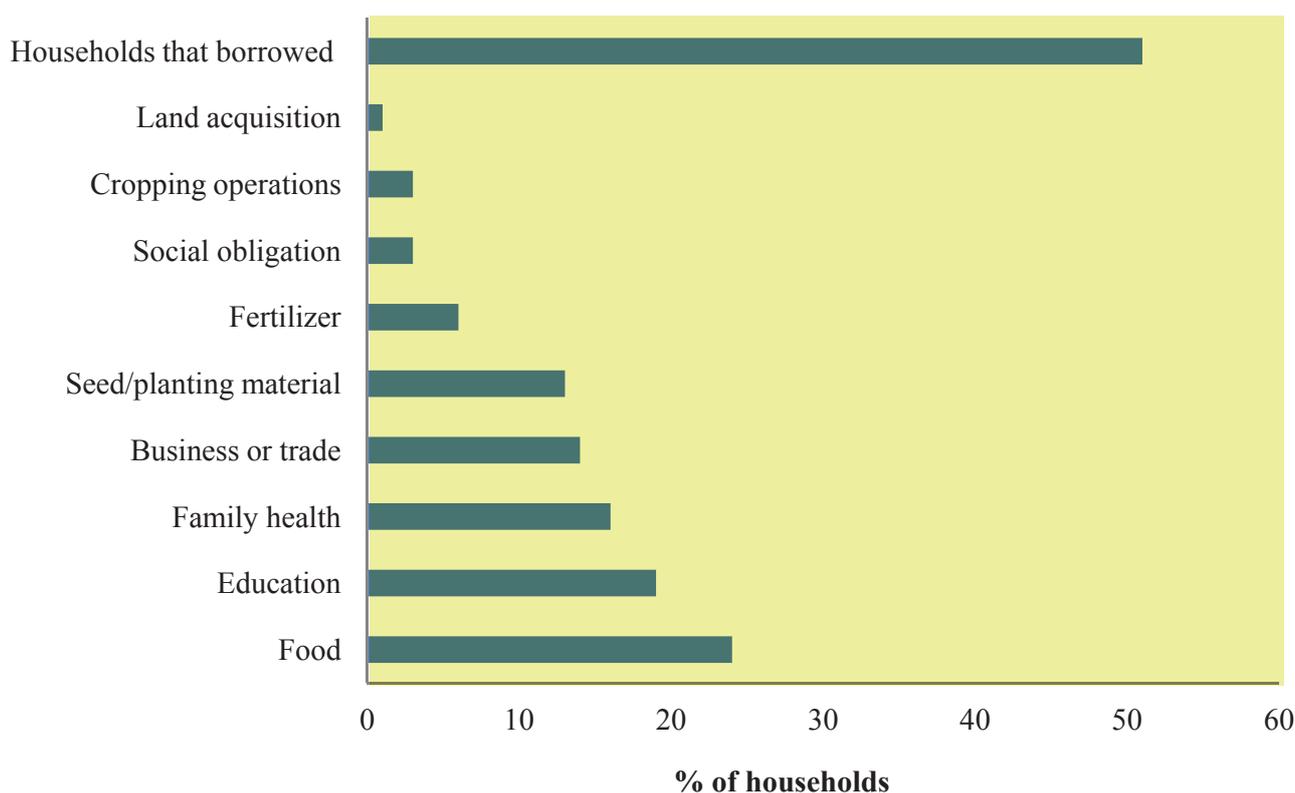


Figure 7. Access to credit in Swaziland.

Table 21. Group membership and activities in Swaziland (% of households).

	Region			All
	Hhohho	Lubombo	Manzini	
Credit and saving	10	11	40	22
Input–output marketing	13	13	12	13
Safety nets	2	5	3	4
Labor exchange	7	3	3	4
Counseling/Nutrition	0	4	10	2

be defined as “... the existence of a certain set of informal values or norms shared among members of a group that permit cooperation among them”. The World Bank defines social capital as the institutions, relationships, and norms that shape the quality and quantity of a society’s social interactions. Roles of social networks include conflict resolution, the coordination and timing of activities, and the provision of information, for instance, about new technologies and markets.

In the context of this study, social capital is captured by membership in farmers’ groups including support groups, clubs, associations, or cooperatives (Table 21). Members of a community rely on a network of social relationships that provide safety nets for their livelihoods. In farming communities, membership in community associations offers tremendous opportunities to boost agricultural production by providing various forms of support to farmers (Manyong et al. 2008). A larger proportion of households in Manzini reported membership in some organization or social grouping (60 percent) compared with households in Lubombo (38 percent) and Hhohho (37 percent). The most common social groups in which households in the study are members are those that provide credit and savings services as indicated by 22 percent of the households. This is highest in Manzini, where 40 percent of the households are members of a social group that offers credit and savings services.

Membership in groups that provide input–output marketing information was reported by 13 percent of the households. Other social groups to which households subscribe in the study area offer services such as safety nets, labor exchange, counseling, and nutrition.

## Access to extension services

Agricultural extension agents provide technical advice and the promotion of best practices or technologies that can enhance agricultural productivity. In Swaziland, extension services are provided by the Ministry of Agriculture and Cooperatives. It is the main link between Government and the agricultural activities occurring in the country, particularly on Swazi Nation Land. The rural subsistence farmer is the Ministry's primary client. The services offered by the Ministry are a critical component of Government's development initiatives targeted at rural communities. Through the Ministry's extension services, communities and families are supported in their subsistence activities (Muwanga 2002). As illustrated in Table 22, a significantly high proportion of households in the study area reported having access to extension services. This is consistent across all the regions although the proportion of households reached out by extension agents is higher in Manzini. Services provided by the extension agents include the dissemination of information on family health (86 percent), family planning (75 percent), modern crop varieties (61 percent), soil and water conservation (59 percent), and pest and disease control (53 percent).

## Production and marketing constraints

### Crop production constraints

Low productivity is a reflection of marginalized access to resources, the use of traditional technologies (usually low-input), and poor policies being pursued by the various Governments in sub-Saharan Africa (SSA). Transforming agriculture and expanding its productive capacity are therefore, a prerequisite for improving the living standards in SSA. Soil depletion, drought, and occasional floods persist as problems for the future in Swaziland. More than one-quarter of the population needed emergency food aid in 2004/2005 because of drought (SVAC 2006). Drought is the major constraint to crop production in the study communities, followed by pests and diseases, and the use of low-yielding varieties (Table 23). It is unsurprising that maize is most affected by these constraints as it is the most widely grown crop in Swaziland.

**Table 22. Access to extension services in Swaziland (% of households).**

Service	Region			All
	Hhohho	Lubombo	Manzini	
Extension contact	90	91	97	93
Family health	88	82	91	86
Family planning	74	71	81	75
New varieties	67	60	57	61
Soil and water conservation	53	64	57	59
Pest and disease control	57	50	55	53
Input prices	66	40	45	47
Output prices	28	36	37	35
Irrigation	24	27	28	27

**Table 23. Production constraints in Swaziland.**

Production constraints	% of communities				All	Most affected crop	Varieties/Practices
	Hhohho	Lubombo	Manzini	Shiselweni			
Drought	0	100	0	0	60	Maize	Adopting improved varieties
Pests and diseases	100	0	50	0	20	Cotton	Applying chemicals
Low yielding varieties	100	17	0	0	20	Maize	Adopting improved varieties
Weeds	0	0	50	0	10	Maize	Weeding
Low soil fertility	0	0	0	100	10	Maize	Applying compost manure

**Table 24. Major institutional, infrastructural, and market constraints (% of communities).**

Constraints	Region				All
	Hhohho	Lubombo	Manzini	Shiselweni	
Unavailability of improved seeds	0	50	0	0	30
High price of seeds	33	50	25	0	20
Unavailability of fertilizer	0	0	25	0	7
High price of fertilizer	67	50	25	67	47
Lack of access to credit	0	0	0	33	13
Unavailability of extension services	0	0	0	0	7
Lack of market information	0	0	0	33	20
Low output prices	33	50	25	0	20
Lack of physical access to markets	0	0	50	0	13

The adoption of improved crop varieties has been reported to be one of the practices that farmers in the area use to combat the effects of drought on crop production. Intensification of research on drought-tolerant crop varieties is therefore necessary to boost crop production in Swaziland.

### **Major institutional, infrastructural, and market constraints**

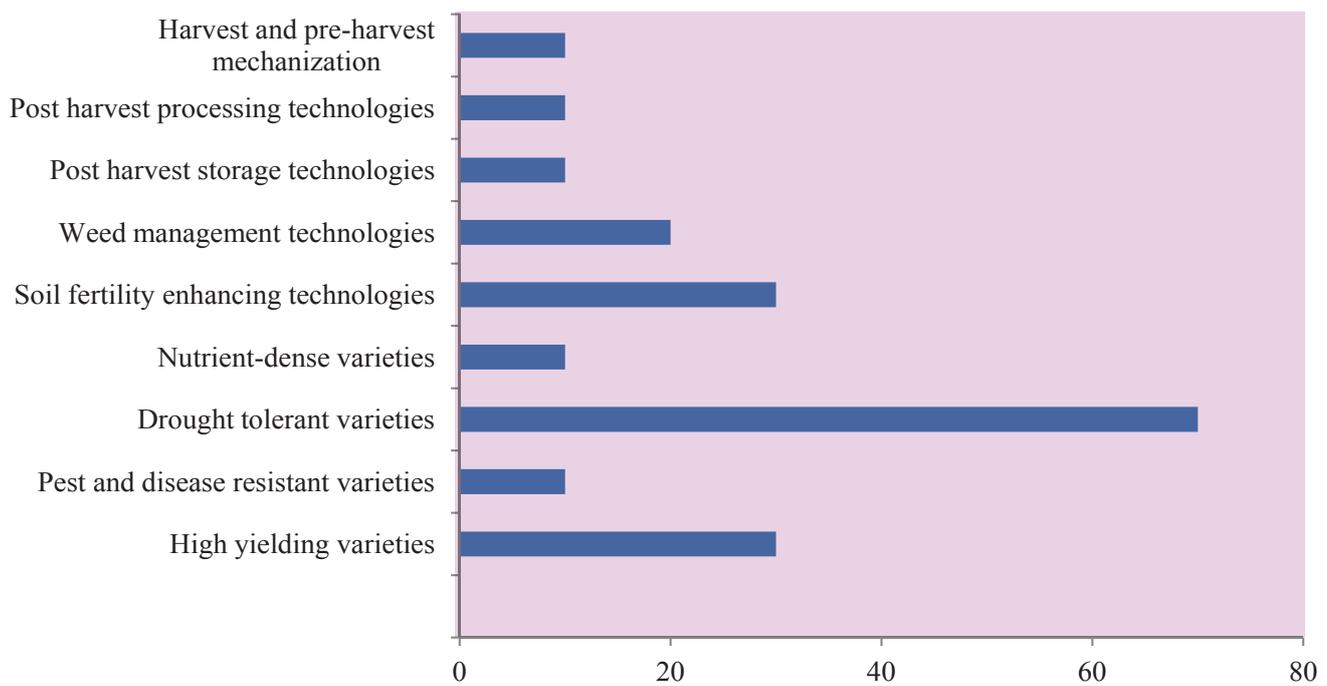
The key factors that will contribute to an environment conducive for pro-poor growth are macroeconomic stability, access to credit, and improved rural infrastructure. Constraints, such as a lack of access to credit and poor infrastructure in the form of poor access to markets and market information, have led to farmers being unable to buy inputs, such as seeds, fertilizers, and other chemicals, leading to lower yields and an inability to help themselves.

High prices of fertilizer (47 percent) and seeds (20 percent) are one of the major institutional constraints affecting the majority of communities in the study area (Table 24). Fertilizer and seeds may be available in the markets but high prices make them unaffordable for the farmers. Communities in Hhohho and Shiselweni are most affected by high prices for fertilizer while those in Lubombo are most affected by high prices for seeds. The livelihoods of the farmers in the study area are also constrained by a lack of market information and low output prices that render the production of cash crops unprofitable.

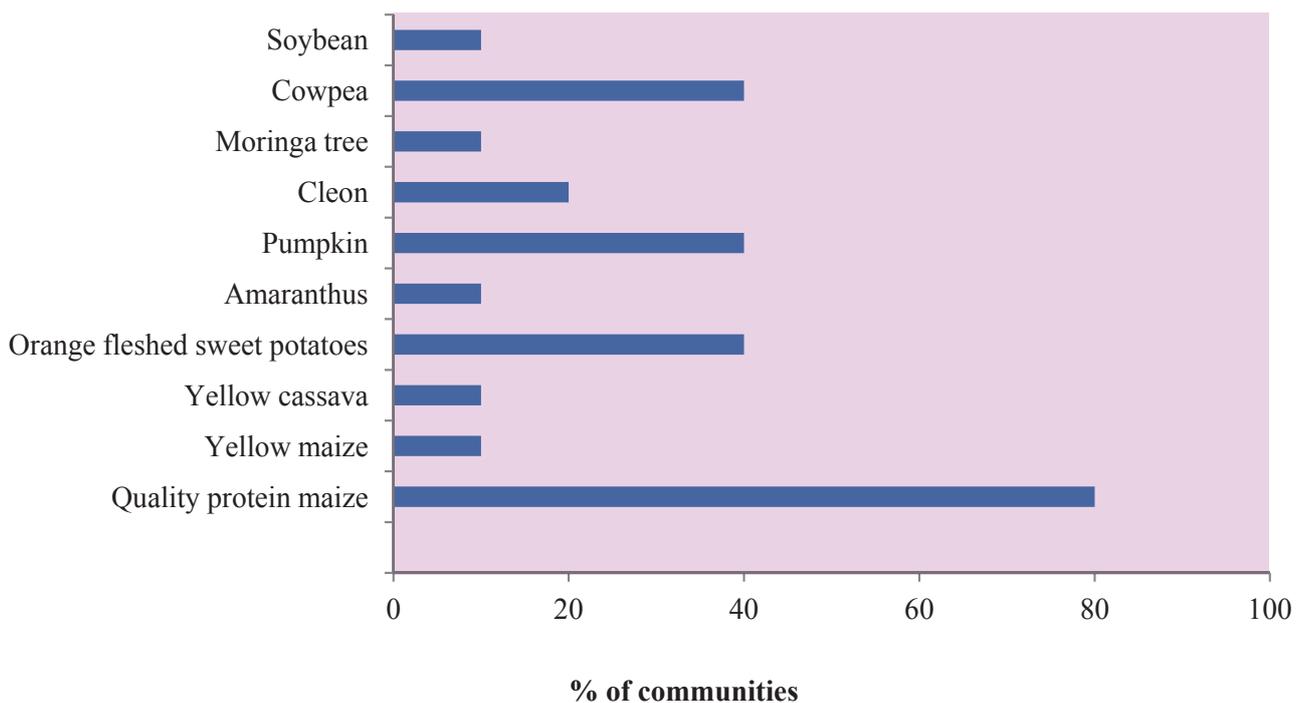
Virtually all African farmers depend on trading for some household needs. However, in Swaziland, most stakeholders, especially smallholders and small-scale traders, have very limited access to information on local and international markets, leading to a lack of knowledge of the quality, quantity, and type of products to be produced and targeted to specific markets. Therefore, enhancing the ability of smallholder, resource-poor farmers to have access to market opportunities and diversify their links with markets is one of the most pressing development challenges facing both governments and NGOs.

### **Improved agricultural technologies**

Agriculture should provide safe, adequate, and nutritious food that reduces deficiencies in micronutrients and enhances the health of vulnerable populations, such as PLWHA. Communities in the study area indicated that drought-tolerant crop varieties need to be introduced because of their potential impact on their livelihoods. This was reported by about two-thirds of the communities that indicated their preference for drought tolerant varieties (Fig. 8). This is consistent with the fact that drought is the major constraint to crop production in Swaziland. IITA and its partners have developed technologies to improve diets, health, and productivity through research on micronutrient content, food toxins, and nutrient patterns. Rapid population growth is exerting pressure on the availability of land for cropping and grazing, forcing households to produce crops on increasingly fragile land (FAO 2006). The introduction of soil-fertility enhancing technologies and high-yielding crop varieties would therefore provide a coping strategy against low crop productivity.



**Figure 8. Preferences for improved agricultural technologies in Swaziland.**



**Figure 9. Preferences for nutritious crops in Swaziland.**

Current research and development interventions emphasize the diversification of crop systems, the development and biofortification of food crops (maize, cassava, cowpea, banana, and plantain) with increased levels of micronutrients, the reduction of toxic substances, stable productivity, higher yields, and better postharvest characteristics.

Nutrient-dense crop varieties, such as pumpkin, cowpea, yellow maize (pro-vitamin A), yellow cassava, and orange-fleshed sweetpotato are some of the nutritious crops grown in the communities. Quality protein maize is ranked as the most preferred nutritious crop that the study communities would like to be introduced or expanded in the area (Fig. 9). This emphasizes the importance of maize as a staple crop in Swaziland.

Sweetpotato is also considered an excellent food security crop in SSA because it often survives when other crops, such as maize, fail. Forty percent of the communities reported their preference for orange-fleshed sweetpotato. This is a particularly promising food for improving the intake of vitamin A in the region as it is widely grown and has high levels of pro-vitamin A carotenoids (Low et al. 2007). Other nutritious crops preferred in the communities include pumpkin and cowpea.

### **HIV/AIDS vulnerability and coping strategies**

In the light of the increasing occurrences of sickness or death in Swaziland, households and communities undertake activities to cope with such impacts of HIV/AIDS. Table A-2 summarizes the various coping strategies that communities in the study area adopt. When an adult member of the household is chronically ill or dies due to AIDS-related illnesses, the majority of households resort to income strategies such as piece work and the sale of crops and/or livestock to raise cash to sustain their livelihood. On the other hand, households adopt consumption strategies including relying on food handouts, borrowing food from other farmers, and reducing the number of meals per day so as to overcome food shortages. Shortages of labor and farm power occur after the deaths of productive household members from HIV/AIDS illnesses. This affects household income generation as well as crop production. To cope with this, households hire labor in exchange for food so as to complement household labor. In other instances, households are forced to leave portions of their farming land fallow so as to concentrate on the land they can manage.

Property grabbing is a serious issue in Swaziland and elsewhere in Africa. HIV/AIDS is a disease creating widows and orphans and property grabbing from women and children is a symptom, cause, and consequence of poverty and the breaking down of social norms, family ties, and social safety nets. It leaves women and children in distress and poverty (Mendicus Mundi Schweiz 2008). However, in the study area, the majority of communities indicated that when the father or both parents die, household assets are left with the wife and/or children and so they are unaware of the equal right to property between men and women. In the study area, more than half of the communities indicated that property grabbing takes place when either the man or both parents die. After the death of a key adult, relatives usually look after the children.

NGOs are the main intervention offering support to households affected by HIV/AIDS in the study communities. Community-based organizations also offer some support to these households. The aim of such organizations is to improve the quality of life for people living with or affected by HIV/AIDS in Swaziland. Services provided include home-based care, voluntary counseling, orphan care, and support groups. Despite this, half of the communities reported that no activities were taking place to support and help them cope with the impacts of HIV/AIDS; this indicates the need for the introduction of such interventions.

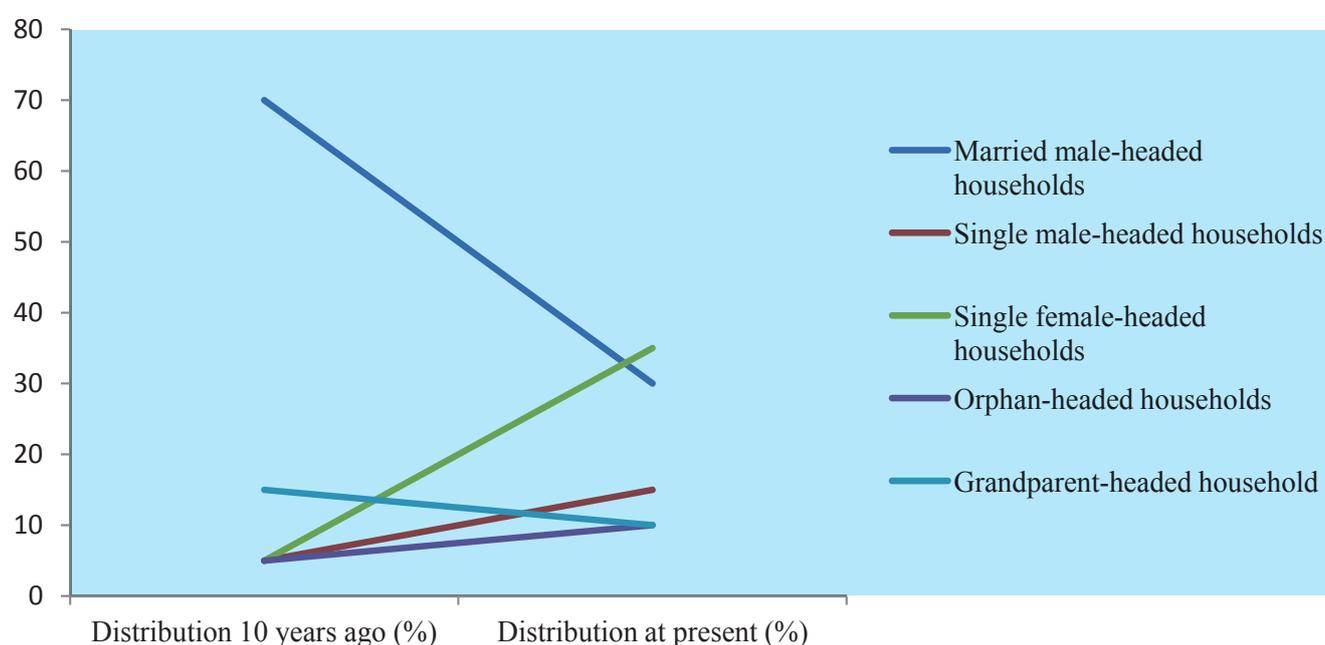
### **Social safety nets**

In Swaziland, the food insecure and poorest households with very inadequate food consumption and affected by shocks are the most vulnerable households as they are not only impoverished and without enough resources for the most basic consumption, but they are also affected by shocks—most likely to be from drought or HIV/AIDS. They would benefit in the longer term from poverty reduction programs, but would require immediate targeted food and cash assistance over a longer period of time, to assist them in recovering from the affects of the shock. Then they could be enrolled into social protection/safety net programs (SVAC 2006). Social safety nets are non-contributory transfer programs seeking to prevent the poor or those vulnerable to shocks and poverty from falling below a certain poverty level. These can be provided by the Government or private sector. Safety net programs from which households in the study area have benefited in times of shocks include free school feeding, free scholarships for children, and free maize or food distribution (Table 25).

According to the Government of Malawi (2006), safety net programs should include livelihood promotion objectives that facilitate, at least for some, a graduation out of poverty, thereby ultimately reducing the need for social welfare support. Therefore, in addition to free distribution of food and other resources to vulnerable households, programs such as Input for Work and Food for Work are also provided so as to reduce the dependency syndrome among those that are capable of working.

**Table 25. Social safety nets in Swaziland (% of households).**

Safety net program	Region			All
	Hhohho	Lubombo	Manzini	
Free school feeding	66	78	79	76
Free scholarship for children	62	80	75	74
Free food/maize distribution	25	80	64	63
Free seeds/fertilizer distribution	21	43	44	39
Input for work	21	43	44	39
Direct cast transfer	27	29	34	30
Food for Work	4	48	16	27
Free distribution of nutritious/fortified food	11	30	29	26



**Figure 10. Household dynamics in Swaziland.**

## Community and household dynamics

### Household composition dynamics

The HIV/AIDS pandemic has had adverse economic and psychological consequences that eventually lead to changes in the family structure in most African countries (Ankrah 1993). Household management has been affected by high levels of orphanhood and widowhood. Elderly members of the community are also forced to take care of their sick children and orphaned grandchildren. This has increased responsibilities and the burden of caring activities on affected households and communities, particularly on women as they are the main caregivers.

The situation is no different in Swaziland. As indicated, (Fig. 10), the percentage of married male-headed households has dramatically decreased while the numbers of single male-headed and female-headed households have both increased over the past 10 years. Similarly, there is an increase in orphan-headed households. This emphasizes the high mortality rates from HIV/AIDS, among other factors. The number of households headed by grandparents, on the contrary, has decreased.

## **Community dynamics**

Community dynamics over the past 10 years are presented in Table A-3. At the community level, the area of cultivated land has decreased over the past 10 years. The major reason for this is the rapid population growth which, in turn, results in a high demand for land. In addition, drought renders most land uncultivable, thereby reducing the amount of good land available for crop production. Similarly, the livestock population has decreased, since there is a decrease in the amount of grazing land available. On top of this, pest and disease attacks also contribute to losses in livestock in the communities.

As in the household-level results, the number of sick people at the community level has risen in the past 10 years, mainly due to high incidences of AIDS-related illnesses. Consistently, all the communities reported an increase in expenditure on medical care. In addition to having enough food, a diversified diet is also an essential component of food security, particularly for vulnerable households such as those affected by HIV/AIDS. In general, the consumption of vegetables and roots/tubers is lower than it was 10 years ago. Again, this is due to the persistent droughts in the country. There is insufficient water to sustain such crops, especially vegetables.

The availability of infrastructure plays an important role in improving livelihoods. The majority of communities in the study area indicated the presence of primary and secondary schools in their own area. It is therefore not surprising that school attendance has increased. On top of this, the free education policy is also an incentive for poor households since they can send their children to school at no cost. Community savings have, however, decreased in more than half of the communities, because of poverty. The population mainly practices the hand-to-mouth lifestyle, leaving very little room for saving.

Generally, there is need for intervention by Government or NGOs in coming up with the most effective means through which poverty reduction can be achieved and livelihoods elevated in Swaziland. The creation of non-farm opportunities can improve household and community welfare, especially in the face of the persistent droughts that hamper crop production in the country.

## Conclusion

The baseline study was conducted to inform and enhance technology delivery activities and contribute to the development of more appropriate technologies, institutional arrangements, and partnerships for improving the livelihoods of PLWHA under the MIRACLE project being implemented in Swaziland.

Because of population pressure and droughts, landholding sizes are small and fragmented. Households reported an average of 1.2 ha per household. Livestock ownership is also low (3.3 TLU per household). This may be an indication that capital-enhancing interventions are required in the area. The importance of maize as a staple crop is stressed by the finding that it was grown by the majority of households and allocated more than four-fifths of the total cultivated land in the 2011/2012 cropping season. However, self-sufficiency in maize was achieved by only 14 percent of the households. Other important food crops are pumpkins and cowpea; cash crops include vegetables, cotton, and sweetpotato. Major constraints to crop production are drought, pests and diseases, and the use of low-yielding crop varieties.

The most common mode of transport used for the marketing of farm produce is public transport, since most of the households do not own motorized vehicles. The majority of the households sell their produce directly to consumers or fellow farmers, indicating an underdeveloped market infrastructure in the area since farmers cannot enjoy the benefits, such as high prices and bulk sales that they would get from selling to Government organizations, parastatals, and farmers' cooperatives.

Adoption rates have sometimes depended on whether the modern varieties possess the characteristics valued by farmers. The most-preferred traits for maize are drought tolerance, high starch content, and earliness of maturity but farmers prefer pest and disease resistance in soybean and cowpea varieties. Radio and television are the most common media through which households in the study area obtained information on modern crops. Adoption rates are as high as 81 percent for maize. This is a good development, as the enhanced adoption of improved varieties (such as drought-tolerant varieties) can help to increase maize production and thus improve the food security situation in Swaziland. However, adoption rates are lower for cowpea (46 percent) and sweetpotato (30 percent). Lack of funds to purchase seeds and also scarcity of seeds are reported as the main barriers to the adoption of improved crop varieties. This may imply that high prices are rendering farmers unable to purchase the improved seeds. At the community level, the most preferred technology to be introduced is drought-tolerant varieties. Out of the nutrient-dense crop varieties grown, quality protein maize is ranked as the most preferred nutritious crop that the communities would like to be expanded in the area.

Households in the study area complement crop income with income from off-farm work and livestock. The average annual income for households in the study area is US\$739 per capita. This is mainly cash income, as compared with crop income. Almost all households in the study area were engaged in off-farm employment. This implies a heavy reliance on off-farm income. Consistently, off-farm income contributes more than two-thirds of the total household income while crop income only makes up 28 percent. This is mainly due to the high risks associated with crop production, particularly in a drought-prone country such as Swaziland. Measuring the total value of output from agriculture per unit of land, the average gross value of production in the study area is as low as US\$152/ha.

Using a poverty line constructed based on the purchasing power parity exchange rate only about 33 percent of the households live below the poverty line and are therefore classified as poor. This study uses an income poverty line to determine the proportion of poor households. Since the majority of the households participated in off-farm activities from which most of their income is derived, it is not surprising that the results indicate a very small proportion of poor households in the study area, despite more than three-quarters of households reporting that they are food insecure. Results from the logit model show that the poverty status of a household

is significantly related to the education of the household head, household size, the presence of orphans in the household, per capita acreage cultivated, ownership of livestock and farm assets, and access to extension services. The sample households in Lubombo are poorer than those in other regions.

The majority of the households reported that their economic well-being had become worse from a year prior to the interview, the major reason being unemployment. However, they have a positive outlook on their future well-being, once employment opportunities are available in their area. The analysis of household livelihood dynamics shows that household sizes and the number of sick people have increased over the past 10 years. This has in part been due to the HIV/AIDS pandemic and high birth rates leading to population growth.

Information was collected on infrastructure and the public services available in communities in the study area. Increased production and the successful implementation of a rural development program depend on the provision of infrastructure: extension services, technology, markets, social services, and financial services. Primary schools are found in all the study communities; secondary schools are found in only half of them. On the other hand, there is a poor availability of health facilities, with the mean distance being 4.8 km. This is an indication that interventions aimed at improving the health situation in the study area are required, especially in the face of the rampant HIV/AIDS pandemic. One interesting finding is the complete absence of markets for fertilizer and seed/planting material (agrodealers' shops) in the communities under study across all the regions. Government intervention is therefore required to ensure that all stakeholders participate in the development of infrastructure, including markets and road networks. About half of the households had access to, and participated in the credit market by borrowing; a larger proportion (93 percent) had extension contact.

High prices of fertilizer and seeds are the major institutional constraints affecting the majority of households in the study communities. Fertilizer and seeds may be available in the markets but high prices make them unaffordable. Enhancing the ability of smallholder, resource-poor farmers to have access to market opportunities and diversify their links with markets is therefore one of the most pressing development challenges facing both Government and NGOs.

Besides suffering from acute material poverty, the poor in Swaziland also suffer from a high degree of vulnerability to HIV/AIDS, natural disasters, and economic shocks. The major household shock affecting household welfare is a poor harvest due to drought, followed by rising food prices. The adoption of drought-tolerant crop varieties and income diversification are some of the coping strategies adopted by the affected households.

NGOs and community-based organizations play a major part in improving the quality of lives and supporting those affected by HIV/AIDS in the communities. Safety nets, such as free school feeding, free scholarships for children, and free distribution of maize or food also provide some protection against livelihood shocks. It is therefore expected that the MIRACLE project will result in an improved environment, facilitating the access to and use of knowledge for innovation and improved nutrition and health, particularly of PLWHA in Swaziland.

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## Annex

Table A-1. Producer and consumer prices in the community.

Crop	Producer price at peak selling time (SZL/kg)	Consumer price at peak buying time (SZL/kg)
Maize	13	20
Cassava	9.7	11
Soybean	2.8	2.6
Cowpea	14	16
Sweetpotato	14	17.8
Aramanthus	1.9	2.4
Pumpkin	3.6	5.8
Tomato	4.7	7.3
Paprika	0.5	0.5
Potato	6.2	9.3
Beans	39	49
Pigeon pea	1	2.8
Sorghum	20	14
Rice	11	15
Groundnut	17	17
Sesame	0.8	1.2
Tobacco	2.6	3
Cotton	102	102
Cashew	0.7	1

**Table A-2. HIV/AIDS vulnerability and coping strategies (% of communities).**

	Region				All
	Hhohho	Lubombo	Manzini	Shiselweni	
Raising cash if an adult member of a household is ill for a long time or dies					
Sell crops and/ or livestock	0	33	50	0	30
Get assistance from villagers	100	0	0	0	10
Piece work	0	50	0	100	40
Begging	0	0	50	0	10
Get assistance from NGO	0	17	0	0	10
Coping with labor shortage					
Hire labor in exchange for food	0	17	0	0	10
Assisted by well-wishers	0	17	0	100	20
Nothing	100	33	50	0	40
Use labor-saving technologies	0	0	50	0	10
Cultivate only land they can manage	0	33	0	0	20
Household assets when a man dies					
Given to wife and children	0	100	50	100	80
Taken away by man's relatives	100	0	50	0	20
Household assets when both parents die					
Left with children	0	100	50	100	80
Property grabbed away from children	100	0	50	0	20
Surviving household members after death of a key adult					
They remain at the house with the children	0	33	50	0	30
Children live with relatives	0	50	0	0	30
Nearby adults chosen by the community look after the children	0	17	0	100	20
Piecework	0	0	50	0	10
Begging	100	0	0	0	10
Coping with food shortages					
Piecework in other people's fields	0	17	0	0	10
Selling livestock	0	0	50	0	10
Borrowing	100	17	0	0	20
Bought from other farmers and shops	0	17	0	0	10
Handouts	0	17	50	100	30
Reducing the number of meals per day	0	33	0	0	20
Coping with impacts of HIV/AIDS in the community					
No community interventions	0	33	50	0	30
Support from NGOs	100	33	50	0	40
Community-based organizations	0	0	0	100	10
Nothing	0	33	0	0	20
Coping after death					
Assistance from family during the funeral only	0	17	0	0	10
Support from NGOs	100	17	0	0	20
Nothing	0	67	100	100	70

**Table A-3. Community dynamics (% of communities).**

	Region				All
	Hhohho	Lubombo	Manzini	Shiselweni	
Cultivated land					
Increased	0	0	0	0	0
Decreased	100	100	100	0	90
No change	0	0	0	100	10
Livestock population					
Increased	0	17	0	0	10
Decreased	100	83	100	100	90
No change	0	0	0	0	0
Human population					
Increased	100	67	50	0	60
Decreased	0	33	50	100	40
No change	0	0	0	0	0
Community savings					
Increased	0	17	50	0	20
Decreased	100	67	50	0	60
No change	0	17	0	100	20
Expenditure on medical care					
Increased	100	100	100	100	100
Decreased	0	0	0	0	0
No change	0	0	0	0	0
Vegetables in the diets					
Increased	0	17	50	100	30
Decreased	100	83	50	0	70
No change	0	0	0	0	0
Roots/Tubers in the diets					
Increased	0	17	0	100	20
Decreased	100	67	100	0	70
No change	0	17	0	0	10
School attendance					
Increased	100	100	100	100	100
Decreased	0	0	0	0	0
No change	0	0	0	0	0
Use of labor-sharing					
Increased	0	17	50	0	20
Decreased	100	67	50	100	70
No change	0	17	0	0	10
Use of labor-saving technologies					
Increased	0	50	100	100	60
Decreased	0	17	0	0	10
No change	100	33	0	0	30
Non-farm activities					
Increased	100	17	100	100	50
Decreased	0	50	0	0	30
No change	0	33	0	0	20
Number of sick people					
Increased	100	100	100	100	100
Decreased	0	0	0	0	0
No change	0	0	0	0	0

