

## **THE IMPACT OF SMALL SCALE IRRIGATION SCHEMES ON HOUSEHOLD FOOD SECURITY IN SWAZILAND**

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### **ABSTRACT**

The main objective of this study was to assess the impact of improved access and use of irrigation schemes on livelihoods and food security. A questionnaire was used to solicit information from four purposefully sampled communities on: crops grown and irrigated; output, disposal; status of food security; sources and means used to secure food. Analysis involved comparisons between situations before and after water schemes and between irrigation schemes. Results showed when irrigation schemes are focused at household level and to the fields around the home they contribute to income generation and food security. Majority irrigated their maize (71.8%) and other food crops, vegetables and fruits. Highest proportions of the food insecure were in communities where irrigation scheme was not focused at household level. Irrigation shifted production from subsistence to commercial as well from household to community or association based livelihoods, where individuals are not directly involved in production. Irrigation schemes must be focused to households and fields around homes to improve food security.

**Keywords:** Food security, Household level, Impact, Irrigation schemes, Small holders, Swaziland.

### **INTRODUCTION**

Food security is a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (FAO, 1996; FAO, 2002; FAO, 2003; WHO, 2011). At the household level, food security implies physical and economic access to foods that are adequate in terms of quantity, nutritional quality, safety and cultural acceptability to meet each person's needs. Household food security depends on adequate income and assets including land and other productive resources owned (FAO, 1997).

In sub-Saharan Africa, two thirds of the working population still make their living from agriculture, especially commercial agriculture (ILO, 2007). Approximately 70 percent of the population live in rural areas where crop and animal production, fisheries and forestry activities are direct sources of food and provide income with which to buy food. Increased and diversified food production for family consumption or as a source of income is a basic prerequisite for improved household food security (FAO, 1997). Even though total food supply may be secure in a country or a region, households or individuals may not have access to adequate food. It is thus important for policy makers to distinguish food security at the national, regional and household levels (FAO, 1997). The focus of this study was on household level.

Achieving household food security requires broad policy instruments such as strategies for increased production, supply and price stabilization, employment, land distribution, macroeconomic growth, distribution of the gains from economic growth, population growth and income stabilization. With respect to agriculture more support will be necessary for extension work, credit availability, irrigation and encouragement of greater use of inputs such as fertilizer and improved seeds. Because of agriculture's central role in generating employment and income in rural areas, policies aimed at increasing agricultural production and productivity are essential for improved household food security and nutrition in sub-Saharan Africa. However this does not mean that focus must be only on food production for domestic consumption. Research by the International Food Policy Research Institute (IFPRI) in the Gambia, Kenya and Rwanda showed that cash crop production can result in significant increases in household income and improved household food security (Kennedy & Haddad, 1992). In this context, it is important to emphasize not only the absolute level of income, but also the control of income and the source, as these can significantly influence household food security (FAO, 1997).

Food enters a household in a variety of ways. A household may produce food when it has the human and material resources to do so, and such households are said to have direct access to food. The ability of farmers to produce food in adequate amounts and sufficient variety depends to a large extent on their access to resources. Food is also purchased. Most households purchase a portion of their dietary requirements depending on need and affordability. This type of food acquisition represents economic access. Rural farming households regularly purchase a proportion of food commodities which they do not produce themselves. Given the ways food is accessed, diversity of food and income sources is considered to be one of the main practices against risk in agrarian communities (FAO, 1997).

There are many areas where smallholder's food security comes under risk such as: failure or loss of crop production due to pests and drought; agricultural trade due to disruption of exports and imports; large sudden food price rises and loss or lack of employment. Households which are most at risk are: smallholders with little income diversification and limited access to improved technology such as seeds, fertilizer, irrigation and pest control; smallholders who are highly specialized in export crop; poor households highly dependent on imported food; poor net-food purchasing households and wage earning households (FAO/WHO, 1992).

Global projections on food indicate that hundreds of millions of people in developing countries remain hungry. Developing countries will be more dependent on food imports. Poor countries will be the least able to pay for food imports. Climate change could increase the dependency of some developing countries on food imports. Hardest hit will be small-scale farmers affected by other factors such as drought. Some countries, mainly in Africa are likely to become more vulnerable to food insecurity. Much future production growth will come from increased productivity, irrigation being a crucial production factor. Institutional innovations will be required to create incentives to enhance water productivity to permit increases in agricultural production (Ruttan, 2006).

Livelihoods based approaches have to be adopted by water sector practitioners for water supply systems to be tailored to people's existing livelihoods. Livelihood approaches demands that development interventions and planning to be based on a

thorough analysis and understanding of how people's livelihoods work now, how they have changed over time and could be improved in the future, and of the critical potentials and obstacles to doing so. For the water sector practitioners, taking a livelihoods approach means identifying the existing and potential role of water in people's livelihoods including productive, health and consumptive, and identifying sustainable and effective ways of meeting these needs. The value of a livelihoods approach to water supply is that it leads to identification of the many and complex ways in which water supply improvements have the potential to affect people's lives and identify bottlenecks and prioritise activities. Research has also shown that improving water services only removes or minimizes one potential constraint faced by people in pursuing livelihood activities or only provides one new asset on which they can build on. Other constraints such as the availability of markets may be of equal importance (James, 2003).

One of the key issues in providing productive water is demand management. Unrestricted productive uses of domestic water may not always be positive and desirable. Irrigation of low value crops like cassava does not provide that much income compared to the cost of piped water supplies (Moriarty & Butterworth, 2003). Higher value crops are preferable. Also, beneficial use of water by poor people who may not be served by other systems and for whom any diversification of livelihoods is critical should be encouraged.

Hope, Dixon & Maltitz (2003) established that improved domestic water supply for kitchen garden farming as a significant livelihood activity and a component of food security. They also found out that access to domestic water is disproportionately skewed in favour of the male headed income wealthier households. The authors argue that improved domestic water access offers greater equity and food security benefits to poorer households but the efficiency and sustainability of such a poverty reduction intervention is questioned.

Swaziland is a lower middle income country with a Gross National Income (GNI) per capita of US\$ 2 350 in 2009 (Rural Poverty Portal, 2011). The proportion of those living below the poverty line was 69 per cent (Kingdom of Swaziland (KOS) 2005; UNDP Swaziland, 2008; UNWFP Swaziland, 2008) but this has recently declined to 63 per cent. (Government of Swaziland, Central Statistics Office (CSO), 2011; Times of Swaziland, 25<sup>th</sup> February 2011). The rural areas have a greater share of the poor (89%), with the majority residing on Swazi Nation Land (Government of Swaziland, CSO, 2010; Times of Swaziland, February 25<sup>th</sup> 2011). The economy of the country is basically agro-based, with irrigated sugar predominance. Except for a few large scale commercial farmers on the plantation estates, most of the producers are subsistence small scale farmers, depending mostly on the rain fed agriculture. Although agriculture is the dominant activity, more than 40 per cent of households have never had enough to eat. The number had increased with prolonged drought (KOS, 2005). There are many unexploited opportunities for improving production on Swazi Nation Land (SNL) particularly in the context of crop diversification to improve incomes and food security. The majority (92%) of community groups perceived water supply as a problem, and as such access to water on SNL for small holders is seen as fundamental for them to use their land resources to improve food security (Education Commission of the States (ECS), 2005).

The goal of government in the water sector is to access, conserve, develop and manage water resources in the country to ensure that development is not constrained by lack of adequate water supply and that irrigation, domestic and industrial needs can be met in the most efficient and equitable manner (GOS, 1996). The irrigation sector uses approximately 96 percent of

water in Swaziland. Within the irrigation sector, over 90 percent of the water is used by the sugar industry. At the present level of development in Swaziland it is appropriate that the bulk of water is used by agriculture. However, the legal framework should make provision for the transfer of water to other sectors as they develop. Within agriculture there is need to improve equity by making more water available for small to medium scale farmers (Mwendera, Manyatsi, Magwezi, & Dlamini, 2002).

There is so much effort and investment in rural water supply for irrigation purposes to improve rural household's food security through improved productivity. In spite of all these efforts, food insecurity still prevails. More than 30% of all Swazis are food insecure (UNFAO Swaziland, 2005). According to the preliminary results from the Swaziland Vulnerability Assessment Committee survey (SWAZI VAC), 260.000 people could face a food deficit in the pre-harvest months, especially high food prices continue to erode food access for the poorest and most vulnerable groups (WFP, 2011). This necessitates studies to establish how the current water supply systems impact on rural livelihoods and household food security and make recommendations on policy actions which when implemented will make water projects more efficient and effective in bringing about food security and rural development.

## **METHODOLOGY**

The study region, the Low veldt of Swaziland is a water-stressed area where irrigation schemes play a significant role in improving agricultural productivity. Two communities, Malibeni and Mangweni were selected. Malibeni community had an "irrigation-plus" water project which supplied water for domestic and productive purposes. The irrigation system was directed to cooperative sugar cane farming as well as to individual household plots near homes. Mangweni had only an irrigation system which was directed to cooperative sugar cane farming, and nothing for individual plots around the homes. A questionnaire was used to collect primary data from households from selected communities on: crop types grown; productive uses of water schemes; an estimate of total output, its disposal and use of income obtained; their status of food security; means and sources used to secure food. The results were compared between the two communities as well as before and after irrigation schemes.

## **RESULTS AND DISCUSSION**

### **Productive uses of the water schemes**

In Malibeni households were using irrigation water for their cooperative sugar cane farming as well as on their individual household plots to irrigate maize (71.8%), cassava (17.9%), beans (7.7%) and sweet potatoes (5%). All the vegetables grown in Malibeni were watered, and included lettuce and spinach (38.5%), tomatoes (36%), cabbages (23%), onions and garlic (20.5%), and other vegetables (30.8%) such as green peppers, beetroot and salad beans. The respondents in Malibeni indicated that they were also watering most of their fruit trees such as bananas (64.1%), mangoes (59%), paw paws (41%) and fewer irrigated other fruits such as avocados, oranges, guavas and peaches. See Figures 1 and 3.

In Mangweni the respondents were using the irrigation water system mainly for irrigating sugar cane grown on cooperative basis. Crop production on individual household plots continued to suffer crop losses due to drought. Although 73.3 per cent

of the respondents indicated they grew maize, none of them irrigated it. Very few households grew and irrigated their sugar beans (2.2%), bananas (17.8%), mangoes (17.8%), paw paws (15.6%) and avocados and peaches (4.4%) as shown in Figures 2 and 4. The majority (95.6%) of the respondents in Mangweni did not grow any vegetables. Only two (4.4%) grew and watered their vegetables.

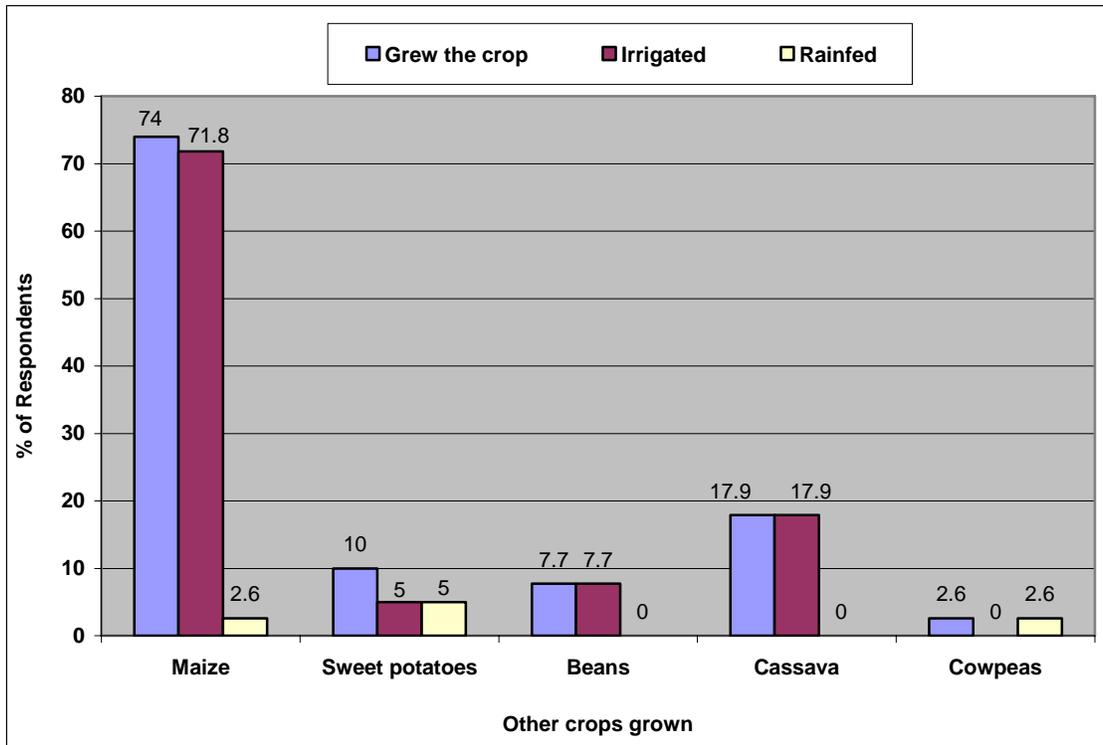


Figure 1: Crops grown and irrigated on household plots after water scheme in Malibeni.

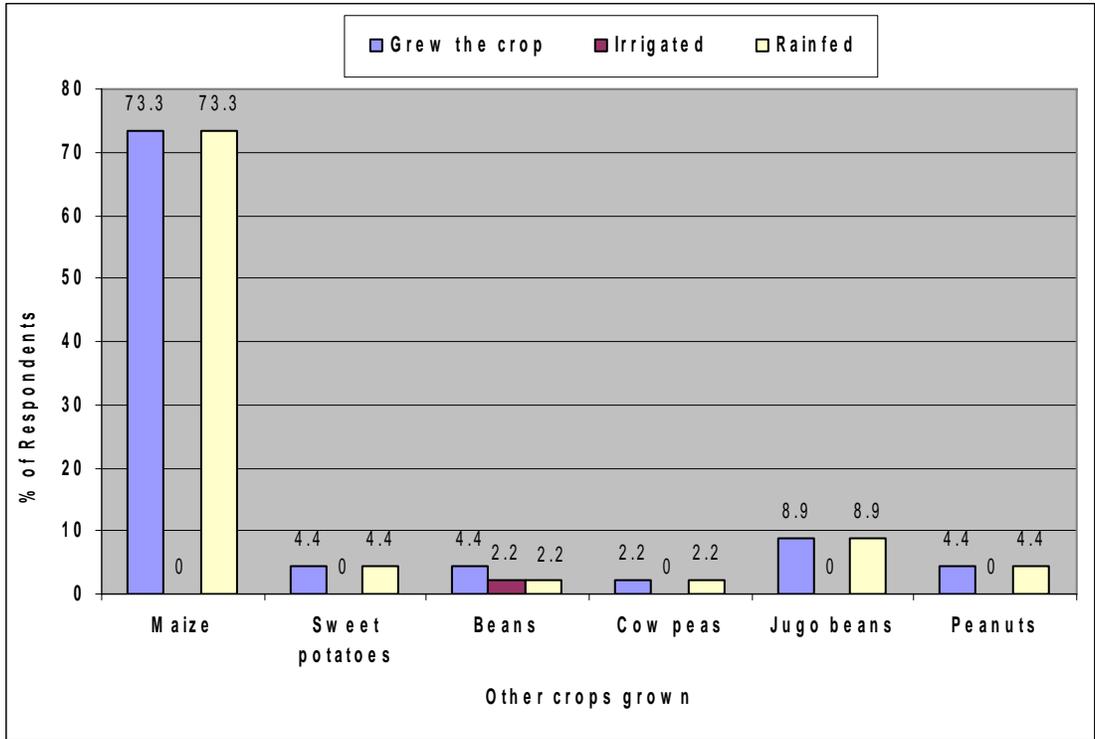


Figure 2: Crops grown and irrigated on household plots after water scheme in Mangweni.

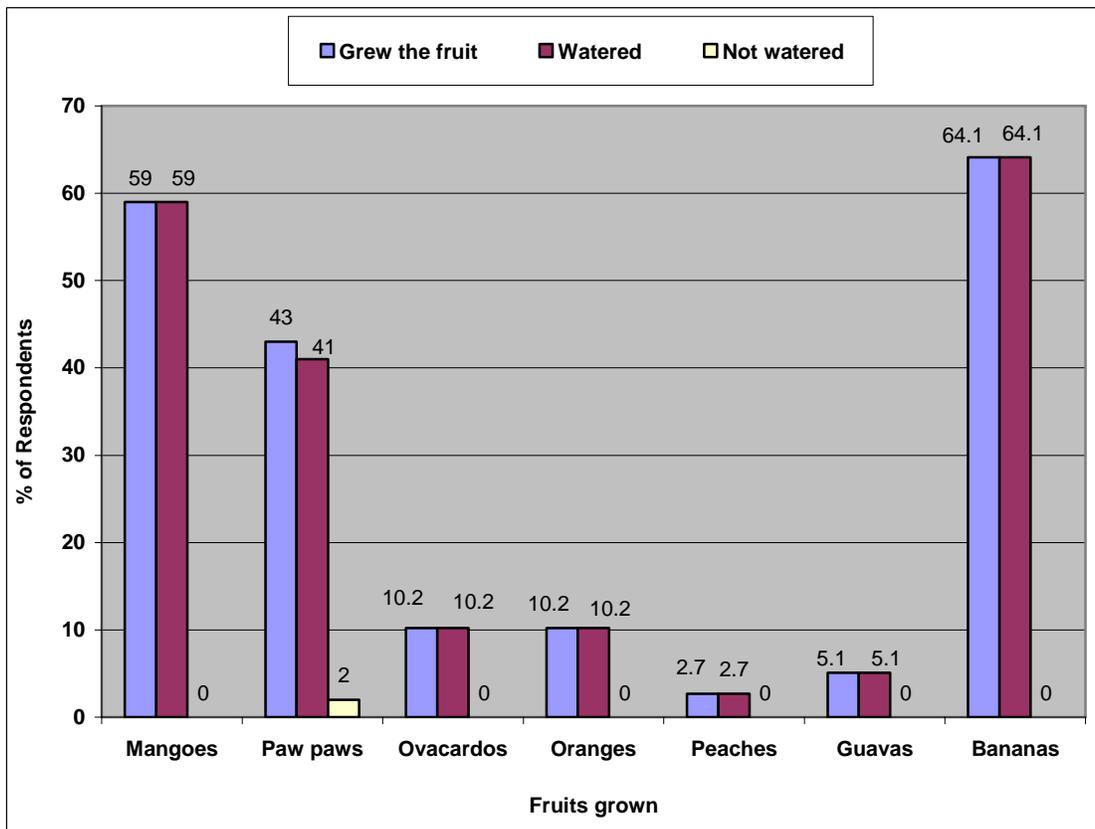


Figure 3: Fruits grown and watered after irrigation scheme in Malibeni.

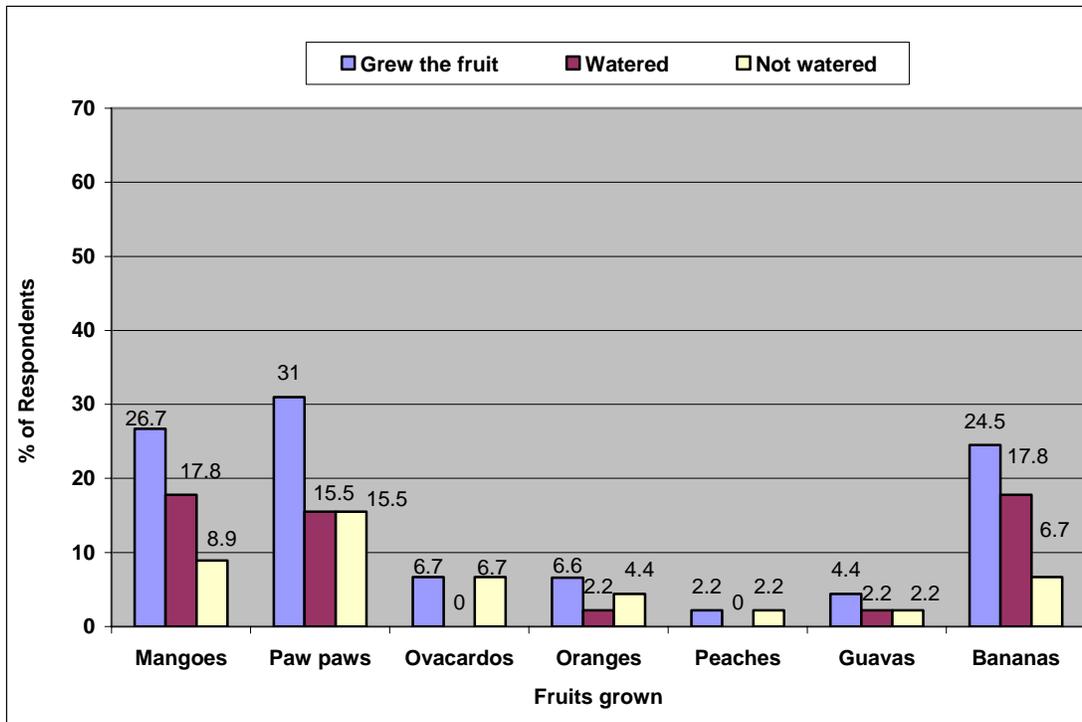


Figure 4: Fruits grown and watered after irrigation scheme in Mangweni.

### Changes in crops grown and their disposal

Changes in the types of crops grown after irrigation schemes were observed more in Malibeni where water was directed to the individual fields around the homes. Access to irrigation water as observed in Malibeni (Figure 5) has changed the emphasis on crop types produced. Maize remains the key food crop grown by the majority (74.4%) of the households even after irrigation schemes, with fewer (15.4%) selling part of this maize when still green. On the over all, still the majority of the respondents in Malibeni (59%) were consuming directly all of their maize produced (Figure 6). The growing of sweet potatoes and cassava, although still low had increased after irrigation schemes. Cassava and sweet potatoes were used for both food and income generation. Cotton was the main cash crop before irrigation schemes as indicated by 56.4 percent of the respondents in Malibeni, and has now been replaced by sugar cane. The fields used to grow cotton have now been converted into cooperative sugar cane fields.

### Changes in the main sources of income

Access and use of irrigation water has significantly altered the main sources of income in the rural communities. All households were now depending on money received as shares from the irrigated sugarcane associations as their main source of income. As the money received from the sugar associations is still low and not sufficient households have to look for other sources to supplement their income. Before the irrigation schemes the main sources of income were wages and other crops grown, particularly cotton. While wage have remained the main source of income for the majority of households, its importance had increased while the importance of other crops declined. The increase on the dependence of wages was from 53.8 percent to 64.1 percent in Malibeni and from 57.8 Percent to 62.2 percent in Mangweni (Figures 7 & 8). Households

were benefiting from the jobs created through irrigated sugar cane. Unfortunately most of those employed in their sugar cane association work as casual and temporary labourers and do not earn sufficient income for their households. The importance of other crops declined from 46.2 per cent to 28.2 per cent (Malibeni) and 57.8 per cent to 24.4 per cent (Mangweni). The main reason for this decline was the land used to grow cotton by individual households was now pooled together to grow sugar cane under farmers association.

Comparison of the two communities (Figures 7 & 8) showed a higher decline on the dependence on other crops in Mangweni where irrigation water was not directed to fields around the homesteads. In Malibeni where water was directed to the fields around homesteads, although there was a decline on the dependence of other crops, the difference was not as big as in Mangweni. Also in Malibeni some households although few (12.8%) were now growing and irrigating vegetables as a source of income, while this could not happen in Mangweni.

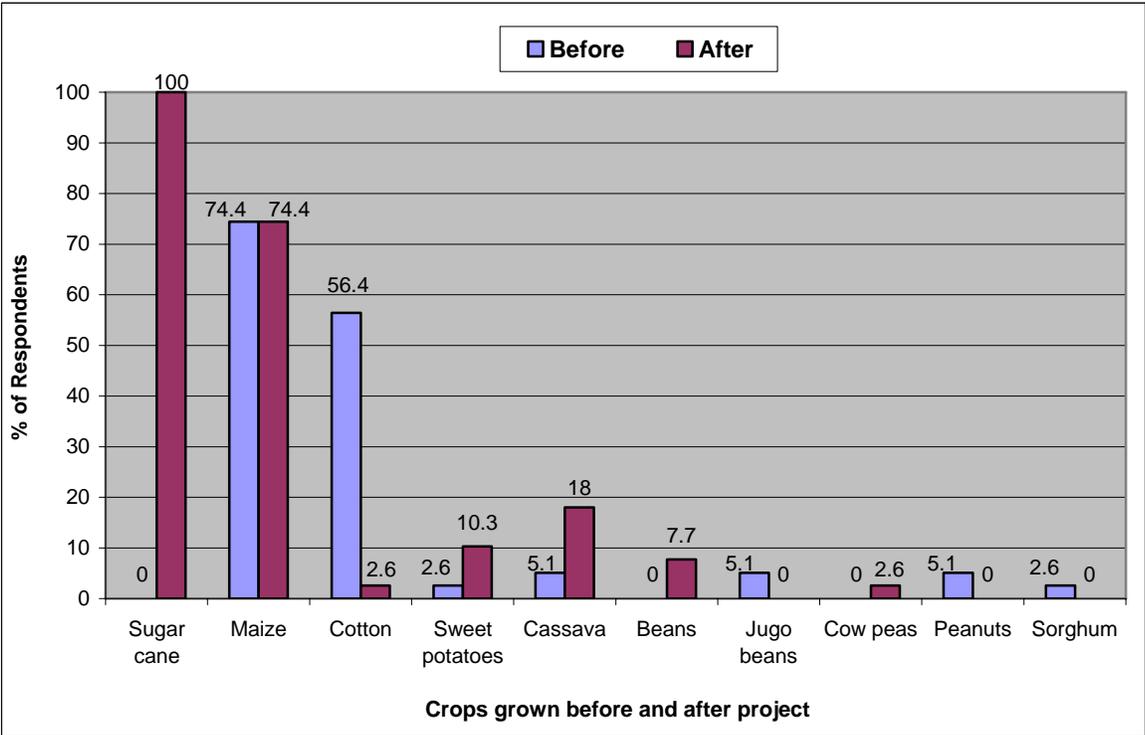


Figure 5: Crops grown before and after irrigation scheme in Malibeni.

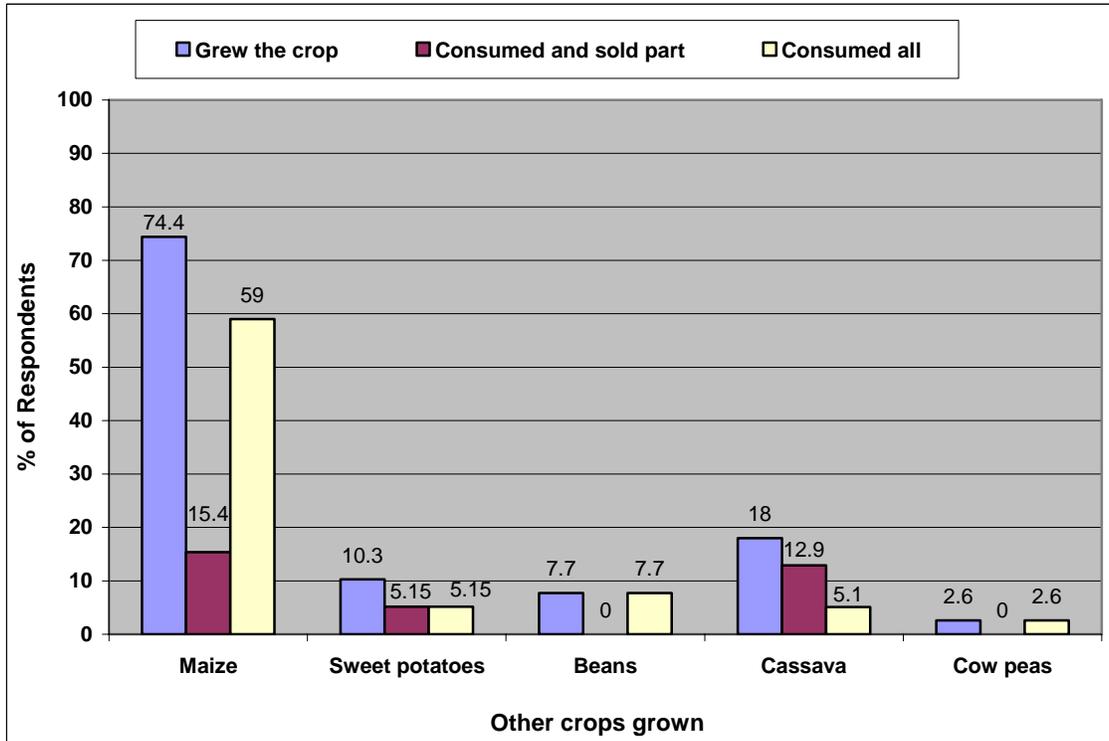


Figure 6: Disposal of other crops grown after irrigation scheme in Malibeni

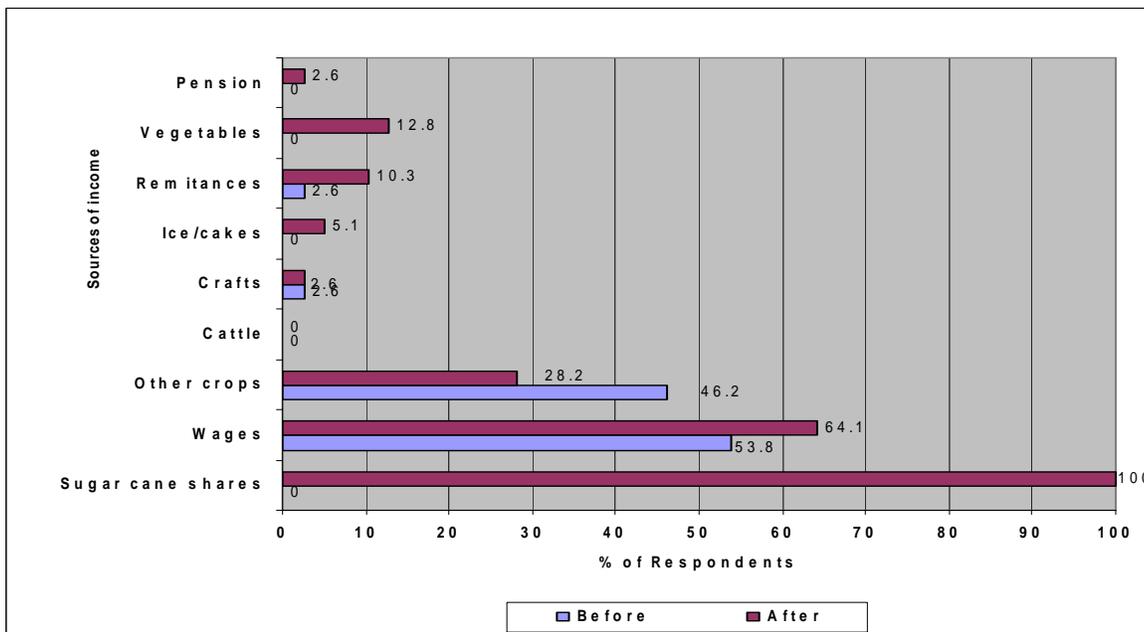


Figure 7: Changes in the main sources of income before and after water schemes in Malibeni

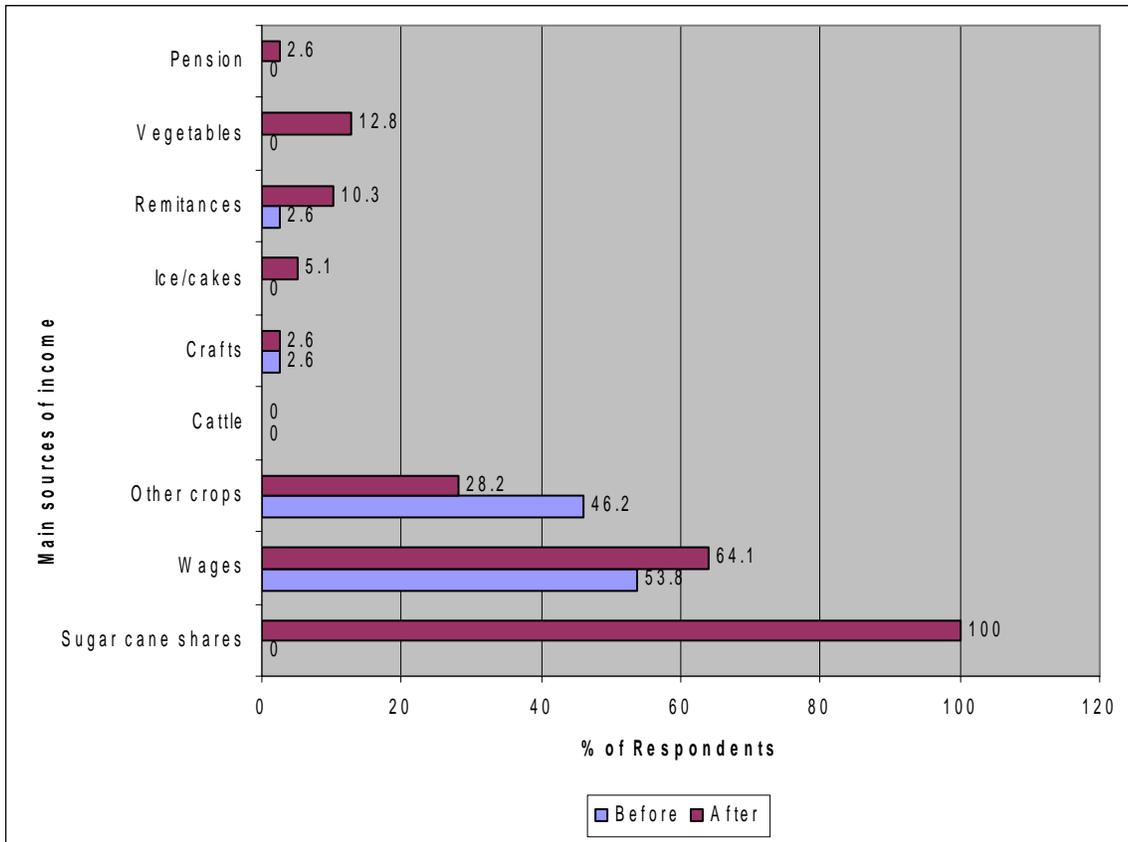


Figure 8: Changes in the main sources of income before and after water schemes in Mangweni

### Impact of irrigation schemes food security

#### Sources and means used to secure food

All respondents were members of the sugar cane cooperative and used their shares money to purchase food. As this was not enough they had to look for other sources of food or income to purchase their food demands. The other main sources used to access food (Figure 9) were use of income from internal production and wages to purchase food. During the survey it was observed that some members were working in the sugar cane fields and used this income to purchase food. A significant percentage of the respondents had direct physical access to food through their internal production. Some few households sourced their food through donations and food aid, verifying the prevalence of food insecurity and inability of irrigation schemes to ensure food security to all its members.

The results (Figure 9) indicated in Malibeni fewer respondents (46.2%) used food directly from internal production and many (76.9%) used income from internal production to purchase their food. In Malibeni some of the households were also selling some of their maize (Figure 6). Access to irrigation water to the individual fields around the homes in Malibeni enabled them to commercialize more their agricultural production through the irrigation of green maize and vegetables which are sold for cash. In the dry season green maize which can only be grown under irrigation is a lucrative business for the irrigating communities. In Mangweni (Figure 9) where water was not directed to the individual fields around the homes more

households (50%) had to depend on internal production, mainly from the maize grown during the rainy season, wage income (75%) and donations and food aid (36.1%).

Discussion with community leaders indicated that the little income obtained from the sale of the crops including green maize and fruits irrigated in Malibeni were used for domestic purposes mostly to buy food and in many cases buying dry maize. Income from food crops, in particular green maize was also used for other household needs such as paying school fees and medical expenses. In the past these needs were met by sales of cotton and livestock, while food crops like maize were more reserved for direct household consumption.

#### Status of food self sufficiency

Analysis of food self sufficiency between Malibeni and Mangweni communities (Figure 10) showed very few households were food sufficient in Malibeni (7.7%) and Mangweni (5.5%). The majorities in both communities (Malibeni 53.9% and Mangweni 38.9%) were only managing on average. Significant percentages (33.3% for Malibeni and 36.2% for Mangweni) were below average and few in Mangweni (19.4%) and Malibeni (5.1%) indicated to be in a very bad state. These results indicated that the small holder irrigated sugar cane schemes had not been able to ensure food security of the majorities of the households involved in the associations. Similar findings were documented by similar studies in the country. Manyatsi (2004) concluded that despite several interventions by government and Non Governmental Organisations (NGOs), the contribution of small scale irrigated agriculture to food security was minimal. Also, Terry and Ryder (2007) noted that the recent cut in sugar prices have undermined food security, especially of the poorest households.

A comparison of the levels of food security between the two communities (Figure 10) indicated the situation to be better in Malibeni where irrigation water was also directed to the individual household plots near their homes than in Mangweni where irrigation water was not available to the individual fields around the homes where food crops are grown. In Malibeni more respondents indicated to be very sufficient (7.7%) and average/managing (53.9%), with fewer below average (33.3%) and very bad (5.1%), while in Mangweni fewer were very sufficient (5.5%), average/managing (38.9%), with more below average (36.2%) and very bad (19.4%).

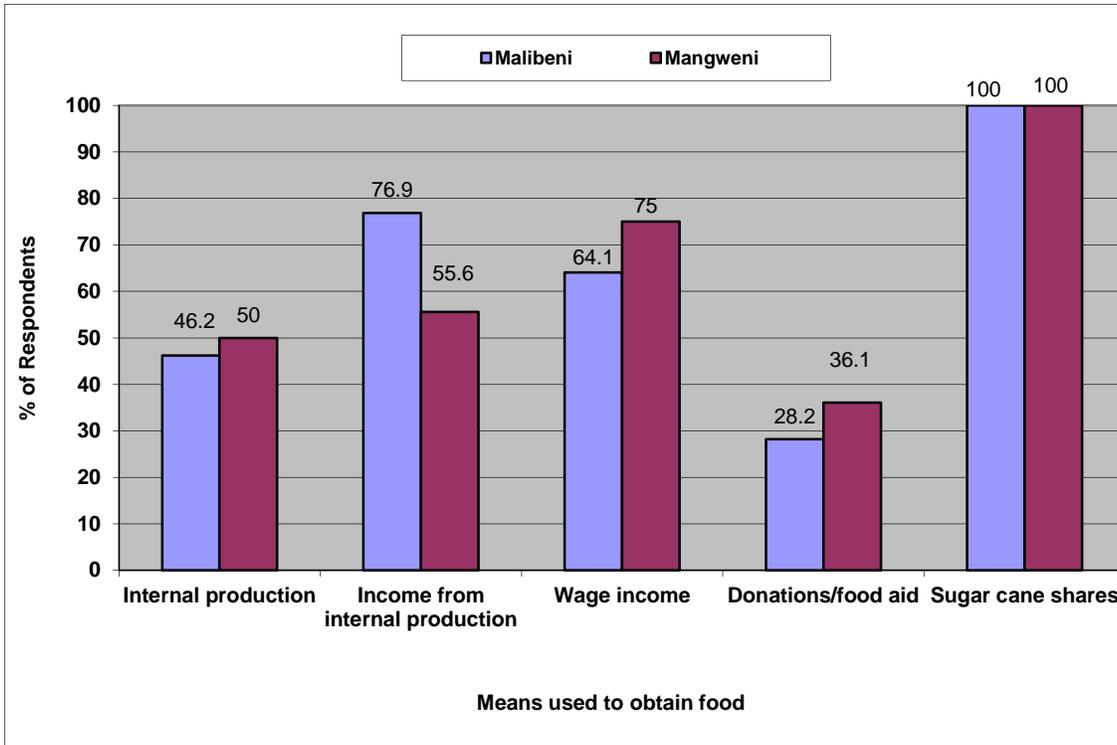


Figure 9: Means used to obtain food in Malibeni and Mangweni communities

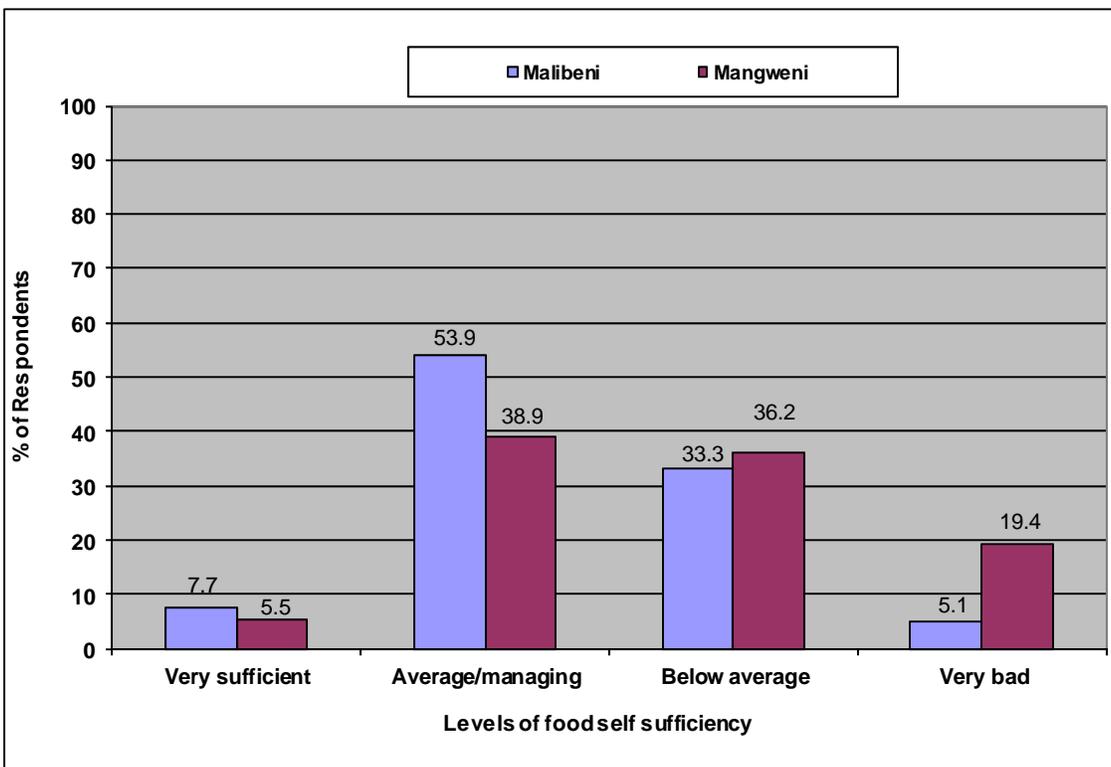


Figure 10: Levels of food self sufficiency in Malibeni and Mangweni communities

## **CONCLUSIONS AND RECOMMENDATIONS**

Small holder irrigation schemes which are well planned and focused at household level and to the fields around the home where food crops are grown can contribute to improved food security through physical and economic access as the case of Malibeni community. In Malibeni households obtained food directly from their internal crop production as well indirectly from purchased sources using income obtained from their internal. Where irrigation systems are not focused at household production and to the fields around the home as was the case in Mangweni community misses the opportunity to contribute significantly to income and food security. It is recommended that irrigation schemes must also be directed to individual household level production and to the fields around the homes where food crops are grown if they are to contribute significantly on poverty alleviation and food security. This conclusion is supported by earlier study (Terry and Ryder, 2007) who observed that farmer associations who opted to keep some of their land as irrigated home gardens rather than converting all land to sugar cane improved food security at a time of low sugar prices.

The small-scale sugarcane irrigation schemes seem to initially reduce income and worsen food security up to a certain level where benefits are realized. For the first few years, the sugar association is busy paying for the loans, thus reduces the money for re-distribution to members. When loans are fully paid, then shares increase and from that time contributes to income and food security. The question is how do these farmers survive during payment periods? The situation is likely to be difficult for those who were already vulnerable at the start. Also, the increase in shares depends on reliability and stability of global sugar markets. Recent changes to the EU's Sugar Protocol have undermined the financial viability Small Scale Irrigated sugar cane farms through its price cuts (Terry and Ryder, 2007). Reduced income from sugar cane means less income to be shared among members which translates to reduce capacity to purchase food and increased food insecurity. Higher value crops like sugar are preferable in irrigation schemes in Swaziland and as echoed by Moriarty and Butterworth (2003). However, when it comes to poor people for whom diversification of livelihoods is critical for household food security like those in the Lowveld of Swaziland it is recommended to make provisions on the irrigation systems to serve the individual fields around the homes where food crops are grown even if these crops do not realise highest economic returns.

Where irrigation water was available at household level has significantly changed the crop types grown. Maize, the main staple food crop is now grown as a vegetable and sold when it is green, reducing quantities of dry maize stored for food. Although the sale of green maize has opened another avenue for earning income it has a negative impact on food security by reducing the quantities of dried maize stored as food reserves for households as well as reducing availability of dry maize in the local market. More households are not only growing fewer types of food crops, but also moving towards the production of marketed crops. Some food crops like sorghum, peanuts and jumbo beans were no longer grown. This reduces both total food produced internally as well as the variety in diets. Also, there is no guarantee that the money obtained from the sale of the crops will be used to buy sufficient food in return. Given the high poverty levels and high demands for cash the money is diverted to other pressing household needs.

Most households spent the income obtained from sale of crops on buying food and mostly maize, which they used to grow or are still growing but sold when still green. The study concludes that irrigation water in Swaziland is increasing rural household's dependence on the market economy for their basic food requirements. There is need for studies to establish as to whether it is more beneficial for the farmer to buy most of their food or produce their own food and the implications of this on food security.

Most of the currently established small scale sugarcane farms are organized under associations. This has shifted the responsibility of income generation and food security to the association rather than on individuals. This explains why others are doing nothing else besides waiting for shares from the association arguing that their land for farming and grazing was taken by the associations. These observations question the viability of the irrigation schemes to alleviate poverty and improve food self-sufficiency and need to be further researched on.

Internal production was not the main livelihood for the majority of the respondents, including those supplied with irrigation water to the individual household farms. It was also observed that the water was not used effectively and efficiently, and some households did not use it at all for productive activities. This reduces the ability of the irrigation projects to impact significantly on household food security. There is need for studies to establish why some households are not utilising the water for productive activities as well as the ineffective and inefficient use of the water. As observed by James (2003), improving water services only removes or minimizes one potential constraint of households in pursuing livelihoods. The other constraints must be established and addressed.

## **AKNOWLEDGEMENTS**

The researcher would like to acknowledge the financial assistance obtained from Water Research Fund for Southern Africa (WARFSA) which facilitated this research venture as to thank Prof. Barbara Van Koppen for her useful discussion and assistance in the early development of the research proposal.

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