

World Vision Swaziland
Agricultural Task Force Report

Agricultural Development Recommendations

January, 2010



In response to the 2008 Food Price Crisis Rein Paulsen, Humanitarian Emergency Assistance Director of Strategy and Humanitarian Policy commissioned the Agricultural Task Force (ATF) to work with three participating national offices in support of the agricultural component of their food security work.

ATF is tasked with collaborating with national and support offices in identifying root causes of hunger; refining our approach to solving the problem and progressively main streaming our findings.

ATF acknowledges the significant contribution to improved food security WV has already made. Even so, the global food crisis has given a glimpse of the major challenges that globalized economies, population growth, climate change and land degradation add to attaining food security. ATF seeks to work with all stakeholders (regional, national and support offices, collaborating communities, government agricultural offices) to improve the impact of WV's agricultural interventions.

This report is the culmination of collaborative work between ATF and World Vision Swaziland (WVS) undertaken in October / November, 2009. The recommendations are put forward as a guide for both national office and support office programming staff when designing, funding and implementing agricultural programmes.

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Acronyms

ADP	Area Development Program
ASCA	Accumulated Savings and Credit Association
ATF	Agricultural Task Force
CBNRM	Community Based Natural Resource Management
FMNR	Farmer Managed Natural Regeneration
HIV/AIDS	Acquired immune deficiency syndrome/human immunodeficiency virus
NGO	Non Government Organization
OVC	Orphans and Vulnerable Children
WV	World Vision
WVS	World Vision Swaziland

A Proverb: Bypassed wealth.

There was once a poor farmer named Joseph. He saw his land as worthless and he despised farm work. Joseph dreamt about leaving his farm and finding work to become rich. Oh how good life would be! So Joseph packed his bag and put his wife and children in the care of his brother and embarked on a long journey.

First he set off for the capital city. He needed work and money in order to travel. In the capital he was often hungry and cold. One time he was cheated on his pay. Another time he was robbed. Another time he was chased out of the city. Life was very hard. Eventually he scraped up enough money and travelled to South Africa.

There was no regular work available. The mines were cutting back miners because of the economic down turn. Factory jobs were scarce. His life was hard, the cost of living was high, and life away from home was dangerous and lonely. After years of struggle he had little more money than when he started, and he was ill.

With great difficulty he returned home.

He went to see his wife, but couldn't find her. She had got tired of waiting and married somebody else.

He went to see his children, but they had grown up and gone their own way.

Frustrated, he decided to go and see his old farm. But when he arrived, everything had changed. There were trees, a mix of annual crops, livestock, bee hives, irrigated garden and orchard, new buildings and many workers. The huts had been replaced by a two storey brick house.

He asked a guard "what has happened here? How did the owner become so wealthy so fast? And, what is all this activity here?" The guard replied that the owner worked very hard on his new farm, caring for the land and cultivating the crops. He took advice from technical experts, diversified his activities and invested in good seed and equipment. In time, his hard work and investment paid off and he became a very successful farmer. His wife is looked after by her servant and his children go to the local school.

Joseph went back to the village and cried.

Everything that he sought was now beyond his reach.

Even what he once had was now gone.

He had travelled far looking for riches, but failed to see the riches at his feet!

If only his eyes were opened before he sold his farm.

There are many Josephs in Swaziland. Their land is rich and full of potential, but they do not see it and they seek their fortunes elsewhere. Unfortunately, more Josephs end up worse off than those who prosper. If only they knew how to appreciate, best manage and benefit from what they already have!

Executive Summary

Four things which impact food security significantly stand out to the first time visitor to Swaziland:

1. Basic agricultural principles are not being followed by farmers. Small, low cost adjustments to current rainfed farming practices could result in significant yield gains.
2. There is a severe agricultural labour shortage, particularly in terms of male Swazis impacting food production. Increasing the labour force for agriculture and reducing labour intensiveness of activities are pivotal to increasing food security.
3. Concomitant with this, farming needs to be a profitable dignified profession if more men and youth are going to be attracted to agriculture. Swaziland has the capacity to grow more food and non food agricultural commodities, but a favourable market environment is lacking.
4. Swaziland is blessed with large areas (36% of the landscape) of biologically diverse forests which for the most part are not accessible to communities except for grazing and limited firewood collection in some cases. Granting communities greater access and management rights to this resource would increase and diversify their income generation capability while reducing the rapid rate of natural resource degradation.

This assessment concludes that WVS' success at bringing about a greater degree of food security will largely depend on its ability to –

- introduce appropriate changes to rainfed farming practices,
- make agriculture a profitable and dignified profession which attracts more men and youth
- facilitate community based utilization of natural resources.
- build on successful gardening promotion work, learn from failures and persevere in promoting best practice approaches

Required adjustments to farming practices are relatively low cost and simple and include timeliness in planting, applying conservation agriculture principles of not turning the soil, leaving crop residues on the surface and maximizing capture and utilization of water in the field. Conservation agriculture will simultaneously address issues of declining soil fertility and erosion, labour shortage, drought and variable weather patterns. Diversification of farming activities (to include e.g. livestock fattening, bee keeping, agroforestry etc), will increase resilience to climatic shocks while increasing farm income.

Attention needs to also be given to market access and development in order to ensure that farm activities are profitable. Swaziland could grow much more agricultural produce including food, but low prices and difficulty of marketing are disincentives for farmers to grow more. Niche markets for high value crops (such as nuts and berries etc.) or speciality markets (e.g. cosmetic, herb, health, organic and wild food markets) should be explored and potential risks and profit margins understood before investment of time and money is made.

Community Based Natural Resource Management (CBNRM) will provide meaningful counter season employment and improve income generation through sale of alternate products such as firewood, timber for building and carvings, honey, nutritious wild foods and through tourism. This in turn can provide the economic incentive necessary to keep more of the labour force in rural areas. CBNRM also has the potential to enhance crop and livestock production and protection, reduce soil and water erosion, increase soil fertility and enhance ecosystems. There are successful precedents for CBNRM (See Annex I) and relevant government departments expressed strong interest in supporting WVS in such endeavours.

Key Recommendations

In order to ensure appropriate rainfed farming, irrigated gardening practices and community based utilization of natural resources are facilitated and adopted, the following recommendations are made:

1. WVS internal changes.

Appoint a national office level agricultural coordinator

Instigate regular agricultural forums

Ensure that technical assistance and resources including transportation are available to WVS staff

Improve planning, follow up and monitoring and evaluation of agricultural and environmental projects

(Annex V).

2. Improve agricultural practices and policy environment.

Persevere with gardening promotion, building on lessons learnt; exploit 'niche' landscapes for gardening; diversify gardening (Annex VII)

Increase focus and resourcing for rainfed agriculture. Promote conservation agriculture (Annex IV), rotations with legume crops, use of drought tolerant crops, agroforestry (Annex VI) and high value niche crops as appropriate

Improve rangeland management for livestock grazing and fodder production

Promote improved goat breeds, appropriate chicken raising techniques and bee hives at household level

Conduct market chain and development analysis for potential high-value crops before investing time and money into new ventures

Promote market linkages

Advocate for a favourable policy environment for small land holders e.g. for fair prices for agricultural produce, access to markets, good roads etc

Work through lead farmers and train farmer trainers; strengthen farmer to farmer extension methods

Give more focus to households with potential

3. Community based natural resource management

Formally establish CBNRM in selected ADPs

Create market linkages for timber and non timber forest products

Promote ecotourism

Methodology

1. The WVS national director was contacted and Dr. Cliff Dlamini was nominated as liaison person for ATF activities.
2. Field visits were made to WVS Area Development Programs (ADP). WVS staff and community members (men and women) were interviewed and observations were made on agricultural practices and the status of natural resources.
3. A one and a half day Food Security round table for WVS staff (ADP and senior managers, agricultural facilitators and Programmers) was conducted.
4. Meetings were held with University of Swaziland agricultural faculty, Malkerns Research Station staff, mushroom development and promotion centre, Swaziland Nature Trust Commission, Ministry of Tourism and Environmental Affairs, Ministry of Agriculture and Forestry Department.
5. A field visit was made to the Africa Church Theological College which undertakes several agricultural projects including a large commercial macadamia nut farm. Possible collaboration with WVS in promoting improved agricultural practices was explored.
5. A field visit was made to the Sheweula Community Based Nature Reserve (Annex I) and the Swazi Indigenous Products factory.
6. Discussions were held with road side firewood and wooden crafts sellers.
7. Much of the detail for this report was gleaned from field visits and discussions with WVS staff, WVS contributions in the Food Security Round Table discussions, Government departmental staff and community members. Additional information was gleaned from various Food Security reports on Swaziland and through web searches.

Swaziland Country Background



Location

Swaziland is a landlocked nation bordered by South Africa to the North, West and South and Mozambique to the East with an area of 17,364Sq Km, of which 15-20% is arable. There are four distinct geographical regions: Highveld - the westernmost, mountainous and forested belt; Middleveld - where most of Swaziland's agricultural activities take place; Lowveld - where much of the nation's cattle farming and cultivation of export crops occurs and Lubombo - where mixed farming occurs.

Climate

The climate is generally subtropical with a high degree of variability. There are steep temperature and precipitation gradients correlating with the fall in altitude of 1200 meters over a distance of 80 kilometres. Average maximum and minimum monthly temperatures range from 22° C and 11° C in the Highveld and 29° C and 15° C in the Lowveld. About 80% of the precipitation falls during the summer months (October to March) as thunderstorms and frontal rains. Average annual rainfall in the Highveld is about 1,400 millimetres, in the Middleveld 860 mm, in the Lowveld about 560 mm, and on the Lubombo about 890 mm.

Population

The population of Swaziland is 1,067,920 people with a growth rate close to zero due to HIV/AIDS. Under five child mortality is 160/1000 (UNICEF 2005); Life expectancy at birth is 37.5 years with the majority of deaths occurring among young people aged 15 – 49.

Poverty

Swaziland is ranked 142nd out of 182 countries on the United Nations Development Program's 'Human Development index' and approximately 69% of the population fall below the poverty line and 43% live in extreme poverty. Swaziland is classified as a lower middle-income country with a per capita income of

US\$ 4,789 (2009). Yet income distribution within the country is extremely unequal: the wealthiest 20% of the population account for more than half of total consumption and there is an ever-widening gap between urban and rural development. About 70% of the population lives in rural areas and is largely dependent on subsistence agriculture and about 25% of the subsistence farming communities have experienced a devastating series of crop failures (from flooding in 2000, hailstorms and intermittent drought in 2001 and recurrent drought in 2002 – 2003 and 2006-2007). Between one fifth and one quarter of the population depend on food assistance and for many reliance on food aid is long standing.

HIV/AIDS

Swaziland has the highest recorded rate of HIV/AIDS in the world with 39.2% of adults being HIV positive. The economically active, aged between 20 and 39 years, comprise about 47% of the reported HIV/AIDS cases resulting in what is normally the most robust age group of society being less able to engage in productive activity as disease and opportunistic infection lowers energy levels. This leaves communities unable to cope with the consequences such as increase of orphans and vulnerable children. The HIV/AIDS pandemic continues to be a major obstacle to economic and social progress.

The impact on agriculture is severe: due to AIDS related sickness and deaths 38.5% of the households suffered reduction in area under cultivation, 47% decline in crop yield, 42% change in cropping pattern, 31% diversion of labour to care for the sick, 22% increase in health costs and 39% loss of regular remittances. All this has contributed to the increased levels of poverty in the country from 66% in 1995 to 69% in 2002 and increased food insecurity. The impact of HIV/AIDS has been particularly hard on Swazi children. There are an estimated 80,000 orphans in the country and the severity of the situation is such that the number is expected to rise to a staggering 120,000 by 2010. Children head 15% of households in the country (World Food Program, Nov. 2009).

Nutrition

Preliminary results from the Swaziland Vulnerability Assessment Committee survey (World Food Program, 2009) indicate that around 260,000 people (24% of the population) could face a food deficit in the coming months, especially as high food prices are continuing to erode food access for the poorest and most vulnerable groups. Prevalence of undernourishment in the total population is 22%; 10% of children under five are underweight for age and 29% of children under five are stunted as a result of chronic malnutrition.

Swaziland Country Background

Agriculture

The agricultural sector in Swaziland contributes to the livelihoods of 80% of the population and provides raw materials for the largely agro-based industries. Maize remains the staple food and is grown by the vast majority of rural households, accounting for approximately 86% of the entire land area cropped on communal Swazi National Land. The remaining Swazi National Land area is cropped to relatively small amounts of cotton, groundnuts, pumpkins and sweet potatoes. Typically Swazi National Land also carries large numbers of livestock grazing on communal pastures. Swazi National Land where some 78% of the population lives and subsists, is no longer characterized by self-sufficiency but is instead marked by low productivity, low levels of commercialisation, relatively low incomes and increasing poverty.

Irrigated sugar cane production dominates the agricultural sector today, providing approximately two-thirds of agriculture's 11% contribution to Gross Domestic Product. Roughly 31% of the total geographic area held by individuals and companies as Title Deed Land is dominated by sugar cane production. An estimated 97% of all Swaziland's available irrigation infrastructure is found on the Title Deed Land and 84% of all irrigation abstractions are used for sugar cane. Much of Title Deed Land is planted to commercial forests and is used for grazing, but a small proportion is planted to citrus, pineapples, vegetables, maize and fodder.

Despite the leasing of tractors by the government, draught animal power is very important with some 55% of rural households estimated to use oxen and donkeys for land cultivation. (Special Report, May 2007).

Over the past years, multiple interrelated factors such as small fragmented landholdings, erratic weather and drought, and minimal access to and high cost of agricultural inputs, reduced employment opportunities, market inefficiencies and high HIV/AIDS prevalence have contributed to chronic food insecurity and gradually weakening livelihoods. In addition, the agricultural system practiced by the majority of the population is dominated by a single crop – maize. Extensive dependence on an annual crop under rainfed conditions also increases a household's vulnerability to erratic weather. Even small shocks to agriculture therefore have a profound impact on the ability of rural households, especially the chronically poor, to maintain their food security.

Natural Resources

Swaziland is endowed with rich water, soil, forest and mineral resources. Mineral resources include asbestos, coal, clay, cassiterite, gold and diamonds, quarry stone and talc. Parts of the country are well watered, and Swaziland has tapped and untapped hydropower potential but drought and low rainfall levels are a recurring problem in the Lowveld. The exploitation of water resources is governed by bilateral or trilateral agreements with South Africa and Mozambique. Two thirds of all agricultural land is used for livestock, the remainder is devoted to arable agriculture and forestry. Forty five percent of Swaziland's area is under forest cover (36% under indigenous forest cover). Key Environmental concerns include limited access to potable water, depletion of wildlife populations because of excessive hunting, overgrazing, soil degradation and soil erosion.

World Vision Swaziland Interventions

World Vision Swaziland's agricultural interventions are having a positive impact under difficult circumstances. Constraints include: enormous demands on the time of WVS Development Facilitators many of whom have multiple responsibilities; resistance to change and a syndrome of dependency by some community members; shortage of community labour due to widespread illness and death, outmigration for paid work and urban drift by youth resulting in a significant absence of working age men for much of the year; some activities such as gardening and orchards are totally new to the community; strong dietary biases favouring traditional foods such as meat and maize and adverse weather conditions.

Current World Vision Food Security Interventions include:

Promotion and support of back yard and group gardens and orchards

In response to food insecurity and the HIV/AIDS pandemic WVS has widely promoted gardening. Development facilitators train community development workers who in turn teach and visit groups of home gardeners. WVS provides fencing materials to keep livestock out. Where possible, rainwater is harvested in dams and gravity fed to the garden. In some cases, gardeners have been taught how to purify grey water using sand filters. Drip irrigation has also been introduced in some communities. Major challenges include insect and disease infestation and water scarcity at times. WVS teaches the importance of all the food groups since vegetables tend to be looked down on as a food. WVS collaborates with the Taiwan Technical Team and government agricultural services for technical input and new crop varieties. Given the constraints listed above, WVS success in promoting gardening is commendable.

Poultry

Chicken rearing enterprises have been promoted largely as income generating schemes aimed at helping orphans and vulnerable children (OVCs). While the profit margin is small, people living with HIV/AIDS engaged in this enterprise feel it is a worthwhile activity as it provides an income, additional high protein food and dignity through meaningful work. Problems encountered include mortality of chicks after long transport from hatcheries, cost of premixed foods and the need to use part of the maize harvest to feed chickens. The Ministry of Agriculture has been encouraging indigenous chickens for their hardiness and ease of rearing.

Micro credit through Accumulated Savings and Credit Associations (ASCA)

ASCAs have been a great success. They are well organized and are having a good impact amongst beneficiaries. There are over 800 members with accumulated savings of over \$120,000. ASCAs enable women to establish small trading enterprises such as buying and fattening small livestock.

Provision of inputs and training on rainfed agriculture

Inputs such as seed and fertilizer are provided on credit in some ADPs along with training on farming methods such as conservation agriculture and the storage and utilization of produce. Seed and planting material include improved drought tolerant and disease resistant sorghum, cowpea and sweet potato as an adaptation strategy to increased frequency of droughts. Improved goat breeds are also promoted.

Neighbourhood Nutrition care points for OVCs

Nutrition and care points have been established and are run by the community. In a number of cases the group members sacrificial giving of their time to assist the OVCs has been outstanding.

Honey Production

In one ADP that was visited, WVS facilitated the formation of a Bee Keepers Association which currently has 15 members. Training along with material to build hives was provided. Individual bee keepers have up to 17 hives and they are gradually increasing their business. The honey is harvested several times in a year. Each hive yields about US\$67 worth of honey per harvest and the honey is sold to a local company for processing. This activity is very profitable, helps farmers to diversify, keeps some youth in rural areas and sustainably utilizes the extensive forest resources available.

Stabilisation of Dongas

Environmental projects for the stabilisation of Dongas are being implemented in a number of ADPs. Causes of donga formation are varied and include over-grazing, high rainfall on bare, steep terrain and generally unstable soils. Lessons are being learnt from the management of these dongas which can be used in protecting other dongas in future.

Field Security Round Table Discussion

WVS staff observations and discussion

In the Food security roundtable discussion, WVS ADP managers and development facilitators presented their challenges, shared on the effectiveness of various interventions and made their recommendations for the agricultural interventions in the future.

Challenges include:

Water. Drought has severely impacted rainfed crop production in recent years and there is a shortage of irrigation water in some ADPs promoting gardening. Dependence on annual crops and using conventional farming methods under rainfed conditions has resulted in low yields in drought years.

Markets. Lack of organized agricultural markets, low market prices for maize, poor roads, long distances to markets, poor quality of produce.

Capacity and attitude. Minimal utilization of local skills, low community skill set, poor management of fruit trees, some lead farmers unable to transfer knowledge, dependency syndrome.

Natural resources. Overgrazing and continuous cropping resulting in low soil fertility and severe erosion; shortage of arable land; firewood and fodder shortages; lack of community management and sustainable utilization of indigenous forests.

Capital and inputs. Lack of capital and lack of farm inputs, especially tractors results in delayed planting (Note: cultivation can be reduced or eliminated with conservation agriculture, see Annex IV). Inadequate fencing materials is also a common problem (Note: *Jatropha* shrubs make excellent living fences: See Annex III).

WVS constraints. Poor project monitoring, low skills on management and monitoring group dynamics, project time frames too short, shortage of technical staff, work overload.

WVS Interventions which have not gone well:

Communal projects have been less successful than projects promoting individual endeavour. Generally, (but not always) they are poorly planned, resulting in poor implementation and management which in turn has resulted in low impact. Backyard gardening has not worked well in some communities as they were not maintained, while in others they were well kept and were very productive. Hungry people and men in particular, tend to despise gardening as not worth the trouble even though some households have benefited very much and

see gardening as a worthwhile activity. In some cases, wrong messages are being sent e.g. Sometimes school children are sent to weed the garden as a punishment, resulting in children associating gardening with negative feelings.

ADPS which are focussing on all components of food security are spreading their resources too thinly and hence are not having a significant impact overall.

Targeting the neediest for assistance with inputs may not result in good impact and can cause divisions in the community and result in dependency. Some people actively try to qualify for food handouts by not taking steps that will improve their situation.

Some irrigation systems promoted have not worked well or they have not been well managed. This may reflect the need for adequate community/individual preparation and training prior to receiving the equipment and it points to the need to select robust irrigation equipment.

Building earth dams has not always been effective – in drought years they have not captured adequate water; in some cases, poor site selection has resulted in disputes.

Utilization of improved chicken breeds has sometimes been hampered by the cost and or the availability of prepared feeds and in some cases because of poor group dynamics.

WVS Interventions which have gone well:

- Awareness meetings and training on drought tolerant crops, (especially sorghum and cow peas which are experiencing a good adoption rate in some communities), processing and preservation of vegetables and on the importance of the three major food groups, etc
- Working through lead farmers and Training of Trainers
- Collaboration with the Taiwan Technical Mission and the government Department of Agriculture
- Training and facilitation of micro economic development, and business skills, home industry training, hand crafts in combination with establishing ASCAs
- Disaster risk mitigation training
- Promotion of gardens and orchards, small livestock (goats, rabbits, indigenous chickens, bee keeping)
- Distribution of farming inputs
- Soil conservation measures

Agricultural Task Force Observations and Discussions

Planning

In general it was found that more attention needs to go into the project planning process. Project planners and managers need to be in the habit of asking four strategic questions whenever involved in embarking on a program or a project: Why, What, Who and How? (See Annex V).

Gardening

WVS has invested heavily in promoting backyard and group gardens and orchards. The degree of uptake and level of success varies, however outstanding individuals and groups were visited. There was evidence that those who applied what had been taught were benefiting such that they would definitely continue in the future. In some group gardens the focus was on food production for OVCs while in others, participants harvested and utilized produce from their individual plots. Given that this is a new activity to most rural Swazi's the progress made and the impact of these activities have been significant. In some cases, 70% of trainees have continued to garden after the second year when WVS no longer provides inputs. In one ADP 1,150 backyard gardens were established in two years. Of these, about 800 are continuing without ongoing WVS support. This is a good indicator of the sustainability of the activity. As individuals and groups persevere and benefit from gardening it is likely that more individuals will participate in the future.

Some of the constraints to adopting gardening include – low status of gardening compared to cattle raising, maize cultivation or money making activities; inadequate and or poorly maintained fences and inadequate and/or inaccessible water supply. Successful gardens had some or all of the following features: access to good technical input, regular follow up by technical staff or by trained group leaders especially in the early stages of adoption, affordable and appropriate strategies for pest and disease control and access to markets. Training on each subject should coincide with the time of the particular activity e.g. training on cooking sweet potatoes should be given at harvest time etc. Good site selection and planning of every aspect of the enterprise is also essential for long term success. Thus, consideration to topography and threats coming from outside the garden such as flooding and erosion is needed. Use of topographic maps and calculation of expected water runoff are helpful in this respect. Careful thought also needs to be given to crop species and variety selection in relation to climatic conditions, marketability and transportability.

Drimie et al (2008) identified common characteristics of successful garden schemes. These included strong community leadership, were initiated in response to a community defined need, were close to main roads with informal markets and water; involved a financial commitment from the members and were initiated by community members themselves.

Cabbages and lettuce are being grown extensively in the plots yet they are not the best choice in terms of nutrition levels, resistance to drought and pests and ability to boost the body's immune system. Cabbage leaves contain only 1.7% protein compared to 38% in Moringa, a nutritious, drought tolerant tree for example. Cabbages and lettuce also require a much greater labour input than say perennial species such as Avocado, Banana, Moringa and indigenous fruit trees (e.g. *Sclerocarya birrea* sub-species *caffra*, commonly known as the Marula tree) or drought tolerant plants such as Amaranth, Sweet Potato and Cassava. While choice of plants is ultimately up to the farmer, WVS could play an important role in identifying exotic and indigenous vegetables and fruits which thrive under local conditions and which could provide more nutritious and immune boosting foods. The importance of promoting more appropriate crops in a high HIV/AIDS environment cannot be overstated. (Annex VII).



Indigenous plum tree just two years old.

Great labour savings can be made by including perennial and drought tolerant species like this in gardening programs.



Above top: Well kept backyard garden. The owner produces a surplus and is able to make a small income from sales.

Above bottom: The fruit of this indigenous tree, boosts the immune system. The tree is hardy, drought tolerant and has minimal maintenance requirements.

While gardening initiatives play a very important role and should be continued, Drimie et al, (2008) call for less emphasis on “boutique” projects that are only locally effective, and for more emphasis on improving programming and linking it with broader policy issues. Given the relative contribution to food security rainfed farming will always have compared to gardening, much greater attention by WVS to improving rainfed farming methods, advocating for enabling policies and making market linkages is called for.

The next two sub sections of this report relate to rainfed agriculture and Community Based Natural Resource Management (CBNRM). Doug Brown (2008) writes “degradation of the natural resources and associated ecosystems of which they are a part, is one of the underlying causes of the chronic and growing vulnerability of household livelihoods in the region. Therefore, sustainable natural resource management needs to be at the core of any effort to reduce vulnerability, improve livelihoods and build resilience in the face of external shocks.” Clearly these sub sections are not optional extras but foundational to attaining food security.

However, programs to ‘introduce conservation agriculture’ or initiate CBNRM, because of their communal nature, will only work if people understand the benefits and due attention is given to building social networks, creating or strengthening formal and informal local institutions and local governance structures. Brown (2008) writes: “Institutions, values and norms dictate how individuals and households make decisions about using their own resources as well as those held in common at the community level.” And this is where the battle lies for WVS. The technical side of appropriate farming and natural resource management is relatively simple. “However, if a desired behaviour is socially unacceptable, it is unlikely to be adopted even if there are strong economic or educational arguments (Brown, 2008).” The hard work, and hence much of our effort needs to be aimed squarely at addressing institutions, values and norms in the short term at least.

Rainfed agriculture

Given the potential contribution of rainfed farming to food security in Swaziland, promotion of more appropriate methods of farming maize, such as conservation agriculture (See Annex IV), introduction of drought tolerant crops such as sorghum, millet and pigeon pea and high value niche crops by WVS are very appropriate activities. However, to have the degree of adoption necessary to significantly impact food security, a much greater commitment of resources and staff on the part of WVS is required.

WVS staff and the ATF team identified the need for adequate technical input to staff and in turn, regular knowledge based agricultural extension and follow up, and the multiplication of WV efforts through careful selection of lead farmers and training of trainers as being critical to success.

Very simple, cheap changes to agricultural practice could result in large yield gains. For example, even though rain had been falling in Swaziland for two months prior to the ATF visit, it was surprising to see that 60-75% of arable land had not yet been cultivated. Timeliness in agricultural activities is critical to success. Generally, late planting occurred because of seasonal labour shortage or illness in the family, lack of funds, and lack of draught animals or because of delays involved in hiring tractors. In Zambia, for every day planting is delayed, there is a 1.5% yield reduction. If this figure applies in Swaziland, a sixty day delay would result in a 90% yield reduction! **By simply planting on time, enormous gains in food security can be made.** In some fields, incorrect plant spacing and crooked rows were observed resulting in uneven competition and sub optimal utilization of soil moisture and nutrients. In extreme cases, ensuring correct plant spacing alone can more than double yields.

Even though maize is the staple food crop, its production has been declining steadily for the past decade. Up until 2000, Swaziland was routinely harvesting over 100,000 tons of maize but since then the average has dropped to around 70,000 tons. In the Lubombo plateau where there is good potential to increase maize production; many farmers weren't interested because low maize prices do not cover the ever increasing production costs. Because of repeated droughts in the Lowveld and parts of the Middleveld, some farmers had given up farming maize all together. Farming has become too risky under conventional farming practices and prevailing weather conditions. There is a clear need for promotion of better methods on the one hand and advocacy for a better policy environment including fairer prices and market facilitation on the other. Inefficient markets and pricing policies give no incentive to surplus producers in the Highveld to grow extra grain and sell to the National Maize Corporation due to low producer prices while consumers in the Lowveld are unable to buy maize due to their poor purchasing power. Alternatively, or at least, in combination with promotion of better methods, one could argue the case for promotion of higher value crops adapted to Lowveld climatic conditions. With the additional income, farmers could buy their maize from surplus production areas where maize is better suited to the conditions



Soil compaction on especially heavy clay soils, exposure of bare soil to the elements, uneven and incorrect plant spacing are evident in this field. All these factors contribute to reductions in yield.



Above: These photos were taken on the same day. The gap between onset of rains and planting time can mean the difference between success and failure. An estimated 75% of arable land was not yet sown at the time of the ATF assessment. Most fields lay fallow, while those sown early were almost ready for harvest!

Other yield reducing factors observed include cultivation of soils on slopes exposing them to water runoff and erosion risk, non uniform soil preparation resulting in uneven germination, bare soil exposed to the elements increasing evaporation and hard pan formation. All of these issues can be effectively addressed with knowledge and skills which WVS staff already have, or have access to.



Opportunities in community based Natural Resource Management

While Swaziland is blessed with extensive indigenous forest cover, most of the population does not have user rights. Even so, indigenous forest and land degradation as evidenced by severe gully formation in many areas are occurring at alarming rates. Examples of moderate to extreme erosion were visible in most districts visited and women are walking up to four hours to collect firewood. Wild fires have had widespread devastating effects in recent years and have even occurred during the cooler months of June and July. Burning dry grass is an annual, destructive practice and overgrazing is the norm. Much of the indigenous forest appears to be secondary growth forest, that is, large commercially valuable trees appear to have been removed and a climax forest has been replaced by dense scrubby growth. This dense re-growth reaches a climax very slowly without human intervention (see Annex VI). It produces low value biomass, provides poor wildlife habitat, and because of its dense nature, suppresses fodder growth and hence gives limited benefit to livestock.



However, excellent examples of initiatives which simultaneously address environmental degradation and poverty issues not only exist in Swaziland (Annex I), they are enthusiastically endorsed by government departments including the Ministry of Tourism and Environmental Affairs and Swaziland Nature Trust Commission. Where communities have been organized and trained and where they have legal access to natural resources, benefits accrued include additional income from tourism, honey, wood (firewood, timber, carvings etc) wild foods and medicines, sustainable management of soils, water, vegetation and grazing resources and meaningful and profitable employment for the community, including youth and men. (See Annex II)

The richness of Swaziland's natural resources is staggering. In one survey (Dlamini, 2007), the author listed over 208 edible species, 39 providing household items, 338 for medicinal use, nine for fuel wood, 53 for handicrafts, nine for fodder; 52 for cultural rituals, 13 for tannins and dyes, 17 for ornamental purposes and eight for thatch. Yet, short and long term benefit is reduced through uncontrolled over harvesting.

There is a clear need to provide secure access and benefits to the people whose livelihoods depend on, or are supplemented by timber and non timber forest products. Establishment of community based natural resource management will assist in attaining food security, lead to more sustainable land use, and agricultural practices and help to keep youth and men gainfully employed in rural areas for longer periods of the year.



Top and centre: Illegal harvest of wood for fire wood and craft items is fuelling deforestation. In contrast, sustainable use of forest resources enhances forest quality, while generating income. Bottom: a young bee keeper in a WVS ADP bucks the trend of young people drifting to the cities.

Recommendation arising from the Round Table Discussions

1. WVS internal changes.

Appoint a national office level agricultural coordinator. The job description would include: regular liaison, co-ordination and collaboration with government departments, local and South Africa universities and practical training colleges, Consultative Group on International Agricultural Research Centres and other NGOs; organizing of training of trainers' sessions; visits to each ADP, facilitation of regular forums for Community Development Workers and ADP agriculture facilitators and advocacy for additional funding for agricultural initiatives through grants and ADP budgets. Forums would provide a platform for information sharing, technical training on agricultural techniques being promoted, experience sharing visits (for farmers and staff), problem solving and to help ensure programs are on target.

Ensure that technical assistance and resources are available to staff for each area of agricultural intervention being promoted. This could involve collaboration with government and non government organizations, ensuring technical materials and web based material is available or accessing expertise within the WV partnership.

Facilitate WVS agricultural staff access to technical expertise, training, regular refresher courses and access to information resources in each intervention being undertaken. Ensure agricultural development facilitators have access to transportation adequate for the task and available when required.

Improve planning of agricultural and environmental projects. Thus, before project implementation assess marketability and utilisation potential of produce, assess plant protection issues and conduct cost/benefit analysis. In addition, the relevant hazards and vulnerabilities to disasters need to be assessed, followed by development of action plans made on the basis of that knowledge. Baseline assessment studies should be conducted to establish the prevailing conditions at beginning of project implementation. Ensure the project provides adequate follow up and regular monitoring and evaluation. Specifically, the key questions – why, what, who and how need to be asked regularly (Annex V).

2. Improve agricultural practices and policy environment.

Persevere with gardening promotion, building on lessons learnt from the approaches used in existing successful group and individual gardens. There are ample opportunities to exploit 'niche' landscapes for gardening where small water courses flow and soils are more fertile. Gardening activities should be diversified to include cultivation of exotic and indigenous vegetables, shrubs and fruit and nut trees for their drought tolerance, disease and pest resistance, nutritional and immune boosting values, reduced labour needs and market potential (Annex VII). More emphasis is required on training of households but also WVS field technicians, on follow up and access to technical expertise. Combine gardening promotion with water harvesting, building of small dams and use of robust irrigation systems.

Increase focus and resourcing for rainfed agriculture. Programming addressing both rainfed farming and grazing systems should be scaled up and best practice methods such as conservation agriculture (Annex IV), rotations with legume crops, use of drought tolerant crops, agroforestry (Annex VI), high value niche crops, fodder crops, hay storage and rotational grazing should be promoted.

Promote improved goat breeds, appropriate chicken raising techniques and bee hives at the household level.

Require market chain and development analysis for potential high-value crops before investing time and money into new ventures. This will give understanding of possible constraints and profit margins.

Swazi government policy lacks focus on the resource-poor farmer relying on rainfall, therefore, advocate for a favourable policy environment for rural communities e.g. for fair prices for agricultural produce, access to markets, good roads etc.

Work through lead farmers in order to have a significant impact: Select lead farmers and train farmer trainers; strengthen farmer to farmer extension methodology. Provide community members adequate training and follow up before introducing new techniques or providing inputs. Promote the formation of Community Based Organizations to take advantage of Farmer Cooperatives. Build social networks, create or strengthen formal and informal local institutions and local governance structures.

Focus on households with potential. Currently, much effort goes into assisting the most vulnerable households which have the least capacity to expand agricultural production. Increasing attention to households with the capacity to invest in profitable agricultural ventures will increase production and increase employment opportunities. It is also important to match individuals and groups with the types of activities that best suit their interests, circumstances and potential.

3. Community based natural resource management.

Facilitate CBNRM. Collaborate with relevant stakeholders (government departments, NGOs, commercial interests, community) to formally establish CBNRM in selected ADPs. Activities include contacting relevant authorities; calling stakeholder meetings; delineating area to be managed; establishing management structure (traditional or cooperative etc.); creating by-laws; facilitating training and creating a management plan which includes baseline study, monitoring and evaluation. Through enhancing rural incomes and giving communities dignity in their work, it is envisaged that fewer men, women and youth will be enticed to leave home to seek employment and a better future outside of their region.

4. Miscellaneous recommendations arising from the round table.

- promote appropriate agro-processing and value adding activities at house-hold level for income generation
- skill development for group members to allow diversification of business and new income generation opportunities.
- promote labour saving technologies that can be easily used by women and people living with HIV/AIDS and which will reduce drudgery and make farming more attractive to youth.
- determine when to work at the household level and when group work is the most appropriate approach
- mainstream Disaster Risk Reduction into ADP development plans
- stabilize existing dongas and prevent new donga formation
- promote appropriate crop/grain storage methodology to reduce wastage and enhance food security
- promote drought tolerant, quality protein maize and open pollinated crop varieties, as opposed to hybrids.

Conclusion

While Swaziland faces considerable challenges to attaining food security, this assessment finds that food security and even food surplus is possible. WVS is already doing good work in various aspects of food security. However, greater impact is possible through more focus on agricultural production and marketing, better coordination of activities, collaboration with others and attention to technical input. Scaled up promotion of conservation agriculture for rainfed farming, improved grazing and livestock management, marketable high value crops, diversified gardening activities and community based natural resource management are seen as key focus areas to work on.

World Vision cannot do this work alone and needs to collaborate with other agencies and government departments, and primarily, must work through communities themselves building on existing strengths and multiplying results through training of trainers.

Advocacy for and promotion of a state led enabling environment for resource poor small landholders which stimulates markets and economic development is also necessary.

Glossary

Community based natural resource management (CBNRM): "CBNRM is about local people coming together to protect their land, water, animals, and plants, so that they can use these natural resources to improve their lives and the lives of their children and grandchildren. It is a tool to enable every willing member of the community to play a part in improving the quality of people's lives – economically, culturally and spiritually. CBNRM is a way for communities to work together to protect their natural resources and at the same time bring long-lasting benefits to the community (Mitchell. D).

Conservation agriculture: is a method of farming involving the simultaneous sustained use of four principles:

- minimal soil disturbance (ideally no till and direct seeding)
- permanent soil cover (ideally 100% cover using crop residues and/ or green manure cover crops)
- multi-cropping (ideally crop rotation) and
- integration of crop and livestock production.

Donga: erosion gully.

Secondary growth forest: is a forest or woodland area which has re-grown after a major disturbance such as fire, insect infestation, timber harvest or wind throw, until a long enough period has passed so that the effects of the disturbance are no longer evident.

Swazi Nation Land: The Swazi Nation Land (SNL) is vested in the king in trust for the Swazi nation, and cannot be individually owned or sold. Land belongs to the nation and not to individuals. Individuals have a right of use but not of ownership. The king governs the land through local chiefs, who act as the main administrators of the land tenure system. Under the customary system, a chief is a head of a community, responsible to the king for land distribution and for ensuring loyalty to the king. Chiefs allocate land to individual households. Thus an individual, seeking to use land, approaches the chief who, in conjunction with the community in the chiefdom, may decide to allocate land to the individual. In principle, every household, through its male head, has a right to land for cultivation and residence, and general rights to communal pasture land. The size of land allocated to individuals is, ostensibly, based on need and ability, but this is not always so in practice. Once an individual has been allocated land, he enjoys some degree of security of tenure, including the right to pass land on to his children. However, the chief can always reallocate the land or evict the household, although this occurs quite infrequently.

Grazing is communal and the location of grazing pastures is determined by the chief with the advice of members of the chiefdom. Land designated as communal pastures is used during the crop growing season. During the winter months, livestock is allowed to graze on the arable land. The local chief often decides when cattle go off arable land and when they return. Consequently, the decision affects the time in which the farmer has to plant and harvest his crops. Fencing of arable land is by tradition proscribed, though of late some chiefs, usually the progressive ones, have tended to ignore this tradition.

Title Deed Land: free hold title land which is privately owned.

Water harvesting techniques: usually involve changing the landscape in such a way as to capture water and or increase penetration into the soil. Techniques include building swales (contour bunds which catch water and allow it to penetrate the soil), zai pits (small holes filled with organic matter which also trap water), trench bunds (micro-dams within the contour) and dams.

Land user rights: rights for natural persons, legal persons or other organizations to use land rights for a fixed period of time.

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The authors gratefully acknowledge the assistance and full support of World Vision Swaziland National Director, operations director and the livelihoods and food security programs advisor who opened the doors for the Agricultural Task Force to make this assessment and recommendations, the World Vision Swaziland staff who freely shared their time and expertise to make this report possible and to the communities for their active participation and contributions.

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Annex I. Sheweula Community based natural resources

The idea for the Sheweula Tourist Mountain Camp and community based forest management came from the local chief who saw that their forests were disappearing. His activities attracted NGOs which provided start up funds. Huts, toilets, a kitchen and Environmental resource centre for environmental training for school children and visitors and for sale of locally made handcrafts were constructed. The Mountain Camp which accommodates tourists began operating in 2000. Tourist fees generate income which pays for operation costs. Initially, staff volunteered, but today income is sufficient to pay salaries. Sale of craft items and tourist donations fund the operation of a school for orphans. Community members benefit through employment, sale of handcrafts and through sustainable harvest of wood, grass, fruits and seeds. A nursery for the propagation of rare and valuable indigenous trees has been established. Today there is greater awareness in the community and there is much less poaching and less tree cutting. When outsiders cut trees, a structure exists for punishment. By contrast, women from nearby communities which do not belong to this management scheme are walking two hours round trip to get firewood for sale and Wood carvers are travelling ever further to harvest special hardwood tree species which have become rare.

An organizational structure has been established for administration: The Sheweula Trust which cares for community needs and has a chief and board of trustees selected from all parts of the community. There is a chair person and vice chair, secretary and vice secretary, treasurer and vice treasurer. Three groups of employees form a coordinating unit under the board – those responsible for natural resources, for tourism and for administration. Other employees include cleaners, cook and guides. The community is organized according to traditional institutions such as community police and health carers. A student graduate program encourages students from the UK to get involved in various community projects.



Above: environment education centre.

Below: tourist huts.



Annex 11. The Role of Wood and Non-Timber Forest Products (NTFP) in food security and livelihoods



A Marula processing factory offers a range of cosmetic products and employment opportunities for local women who harvest and clean the seed for sale.

According to Dlamini (2007) non timber forest products in natural forests and woodlands contribute significantly to local community and national food security, environmental stabilization, primary health care and economic development through its goods and services. The total value generated by a forest consists of wood and non-wood goods and services. Goods and services of the forest resource can be classified into three broad categories, namely direct use benefits, indirect use benefits and intermediate use services.

The following goods and services are especially important to Swaziland:

Direct use benefits include timber for construction and furniture, wood for crafts and household tools, fire wood, construction poles, wild fruits, wild vegetables, wild herbs, honey, bush meat, insects for food, bird eggs, medicinal products, thatch, grass hand-brushes, twig hand-brushes, weaving reeds, sand/clay, plant dyes, plant resins, seeds for rattles and decoration.

Indirect use benefits include pollination services, fodder for livestock, recreation/aesthetic services (eco-tourism) and religious functions.

Intermediate use services include carbon sequestration, water shed protection, protection against soil erosion, habitat for wild fauna and flora (breeding and nursery functions), biodiversity reserve, oxygen production, acid rain deposition, roles in the water cycle and runoff reduction.

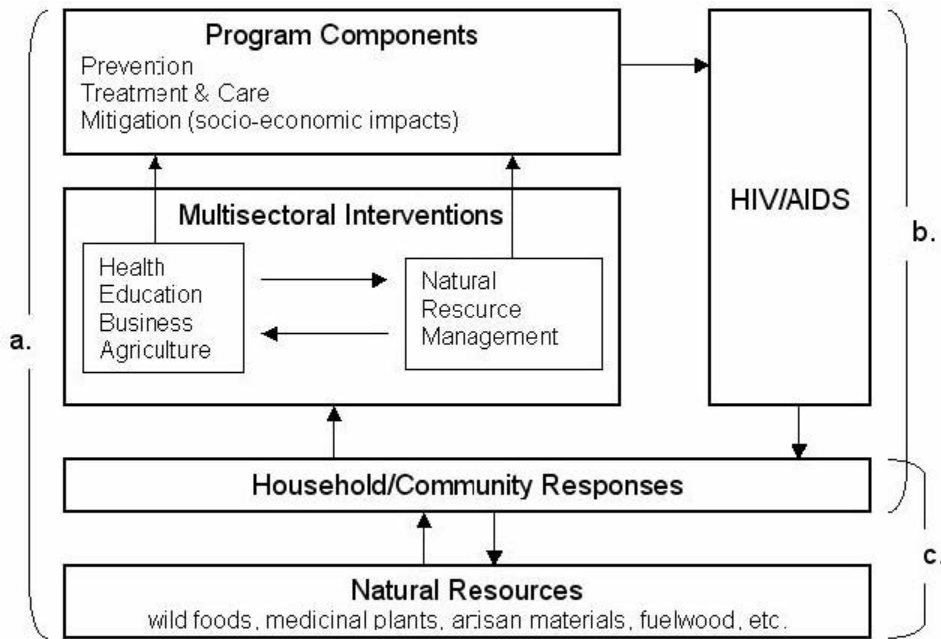
CBNRM programmes can:

- Give people access to resources.
- Improve farming and food supply
- Create jobs
- Build small businesses
- Provide opportunities for education and training
- Build community organisations
- Improve community health
- Maintain and strengthen cultural and spiritual values

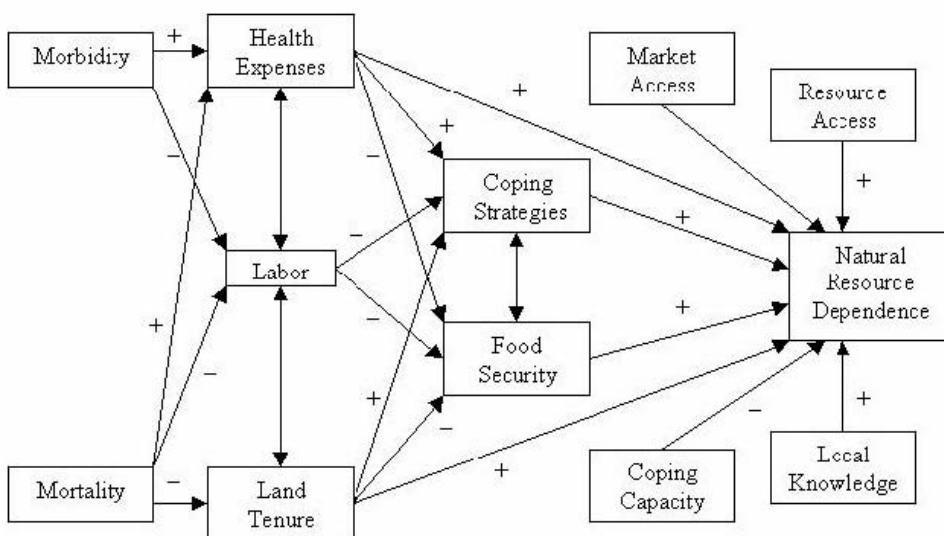
The following categories of CBNRM projects typically occur in the African context:

- Sustainable use of existing natural resources (medicinal plants, grass, trees, wild animals, fish.
- Forestry and agro-forestry
- Community owned and managed conservancies and protected areas
- Co-management of protected areas with official conservation agencies
- Nature tourism (Community based tourism or Community Private Partnerships)
- Integrated rehabilitation of arable land and wetlands
- Integrated management of water catchment areas

Based on the nature and dynamics of NTFPs there exists an interface between natural resources, food security and HIV & AIDS as presented in the frameworks opposite.



Approach to the Integration of Natural Resources and Natural Resource Management in HIV/AIDS Programs
(Source: Marc Edwin Barany, 2003).



Model of Natural Resource Dependence in HIV/AIDS-Afflicted Household
(Source: Marc Edwin Barany, 2003)

Annex III. Benefits of Jatropha Curcas¹



Jatropha seed and kernel.



Jatropha hedge protecting garden, Mali

Jatropha presents some of the most promising pathways to arrest extensive land degradation in the arid and semi arid areas in Africa by combining poverty alleviation (livelihood improvement) and sustainable natural resource use (environment). The main products of Jatropha are low emissions oil and lubricants. Jatropha oil can be used directly as fuel for lighting and cooking, replacing kerosene. It can also be used to run industrial motors and engines. Jatropha biodiesel can benefit communities by providing low cost energy for electricity for cottage industries, providing power to schools, community and health centers and households. If grown on a large enough scale, biodiesel can be sold regionally or internationally.

However, there are many non-transport (non-biodiesel related) based benefits from Jatropha and its oil. A study in Kenya found that the predominant use for Jatropha currently is not for oil production, but for medicine and live hedges. Even if Jatropha may not be a viable crop for market oriented production, its social and local benefits make it worth promoting and planting.

A study by UNDP showed that in rural and low-income households with almost 100% usage of kerosene in domestic applications such as cooking and lighting, Jatropha oil could substitute the kerosene without any need for transformation, thus reducing the household cost for utilities by as much as \$200 US per year². Using Jatropha oil for cooking and lighting benefits low-income households in many ways:

- reduces wood collection time and allows women and children more time to do other more productive activities, including trading and going to school
- reduces deforestation, land degradation and water runoff. It can survive in extremely marginal and alkaline soils, and is relatively cheap to establish and manage.
- provides a cleaner environment where less trees are cut down for wood, while allowing use of low cost, local resources and avoiding expensive, imported fossil fuels
- provides cleaner air and hence a healthier living environment because Jatropha oil produces less toxic fumes than wood and fossil fuels when burnt
- creates domestic entrepreneurship opportunities in the production and sale of lighting and cooking oil, tannins, soap, candles, organic fertilizer, organic pesticides, fuel-brick seedcakes and medicinal products. In this way, Jatropha processing can provide local jobs, lessening the need for rural –urban migration

All parts of Jatropha have some medicinal property e.g. Jatropha latex contains “jatrophine” which has anti-cancer, antimicrobial, antifungal and anti-rheumatic properties. Juice from the leaves is used against piles (externally) and for cough and generally used as an antiseptic. Also the roots are used against snake bites.

Jatropha is used extensively as a boundary marker and also as a hedge to keep animals out of the farm. This reduces farmers' boundary disputes and reduces crop damage from wind and livestock and at the same time lays a foundation for more economic and household benefits. Jatropha production can be integrated into a variety of cropping systems which are adaptable to many African farming communities and can enhance household food security. E.g. Jatropha can be intercropped with vanilla and with under-cover crops such as pulses, grain legumes and sweet potato.

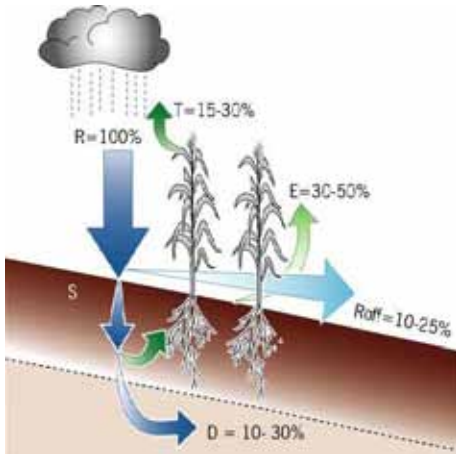
Jatropha offers more sustainable use of land resource than monocropping through:

- Land reclamation, reforestation and agroforestry on wasteland.
- Soil rehabilitation and fertility maintenance through compost and fertilizers generated from its by-products.
- Soil stabilization and erosion control.
- retention and decreased demand for irrigation water.
- Reduced crop losses caused by wandering livestock or wind damage;

¹ Adapted from: 'Viability of Jatropha curcas L. as a Biofuel in Arid and Semiarid Lands in Africa—A research project prepared for World Vision International', October 2007, by Mary Muhtar, Horticulturist and bio-fuel expert

² Assuming 200 liters per year at a cost of 1 US / liter of kerosene

Annex IV. Conservation agriculture³



The frequent crop failures and yield reductions due to drought observed in recent years in many parts of Africa are not just a consequence of climatic variability but to a large extent a consequence of land degradation due to inappropriate agricultural practices. Land degradation, reducing rainfall infiltration, crop water availability, evaporation and crop water uptake capacity, leads to agricultural droughts, where the crop suffers from water scarcity despite adequate amounts of rainfall. Unlike meteorological droughts, agricultural droughts can often be managed by smallholder farmers, through integrated soil and water management practices that focus on maximising crop water access and uptake. Conservation tillage systems, which have in common non-inversion of soil with the purpose of harvesting water and building soil quality, can together with improved soil nutrient management result in substantially improved yields by mitigating droughts and dry spells.

Rainfall partitioning in the semi-arid tropics in Sub-Saharan Africa.

Legend:

- D = Descending water (lost to gravity)
- E = Evaporation
- R = Rainfall
- Roff = Runoff
- S = Slope
- T = Transpiration



Conservation agriculture with soil and moisture protected by crop residue as contrasted to common practice of removing all residues and soil inversion.

Bare soils in fields like this lose 9 mm – 11 mm of moisture per day. Typically, land is ploughed year after year causing “hard pan” formation, especially in high clay content soils (>15 %), loss of soil carbon and destruction of soil structure. Hard pans reduce water penetration and soil water holding capacity.

Inappropriate agricultural methods resulting in extensive soil degradation and donga formation.

³ (Adapted from: Conservation Farming – A strategy for improved agricultural and water productivity among small-holder farmers in drought prone environments. J. Rockström, Unesco-IHE, WaterNet, University of Zimbabwe.)

Crop-livestock interactions

Mulching is a key component of conservation tillage. Free post harvest grazing is legion in most agro-pastoral communities. Since crop residues are consumed by livestock none remain at the onset of the rainy seasons. Even if crop residues would remain, the lack of fuel wood and materials for construction is generally so severe that residues are often used for these purposes. Thus a conservation tillage decision is also an animal husbandry and household management decision. Binding local agreements on controlled grazing of crop residues or cover crops offer a solution to this constraint. Farmers argue that the only source of fodder for their animals in the dry season is crop residue. Reduced dependence on crop residues for fodder can be achieved through improved grazing management and agroforestry practices such as Improved Fallow and Farmer Managed Natural Regeneration.

A labour saving technology

A major constraint in semi-arid farming systems of Southern and Eastern Africa is the poor timing of farm operations. A lack of strong animals for traction often means that ploughing can only be done after the onset of the rains when the topsoil is moist. Furthermore, many farmers do not have access to oxen, making them dependent on borrowing or renting oxen from neighbours or renting tractors which is expensive.

The effect is that primary tilling operations are seriously delayed in relation to the onset of the rains. In semi-arid areas of Swaziland, this can constitute the difference between getting a yield and total crop failure. On-farm trials in the dry semi-arid parts of Machakos district in Kenya, show that dry planting during the long rains of 1999 (March - June), enabled a farmer to harvest between 600-700 kg DM grain ha⁻¹ of maize, while the neighbouring farms planting two to three weeks after the onset of the rains experienced complete crop failure. A transition from conventional ploughing to ripping in permanent plant lines enables resource poor farmers to carry

out primary tillage during the dry season when draught animal power is easily available and to plant in time, either dry or with the first rains.

In a wider context, conservation farming also addresses one of the major challenges facing agricultural development on the continent, namely the growing deficit of labour and reduced physical human energy due to the HIV-AIDs pandemic. Increasingly rural households are female headed with a declining and weakening labour force. Labour saving technologies are urgently needed to address the human constraints of disadvantaged households. The possibility offered by conservation farming technologies – to reduce primary tillage operations at least down to a third of conventional ploughing needs, plus enable dry season land preparation – needs to be acknowledged within this context.

Integrated soil and water management

Small-scale farmers in the region generally do not have access to enough organic sources of soil nutrients to replenish soil fertility even on a short-term basis. For example the estimated annual average export of nitrogen (N) and phosphorus (P) through removal of grain and stalks from small-scale farms in the Kenya dry lands amounts to 56 kg N ha⁻¹ and 7 kg P ha⁻¹ respectively. In-organic fertilisers are perceived to be too expensive by small-scale farmers. A problem with conventional fertiliser extension in the region is that organic and inorganic sources of soil nutrients are often broad-casted over the entire crop fields, resulting in large losses (through weed nutrient uptake, and surface/sub-surface leaching). With conservation tillage fertilisation can be applied to the planting pits or lines and thus more efficiently used by the crop.

Fertilizer-use efficiency increases with the soil water availability. Increased rainwater use efficiency through conservation tillage offers therefore a win-win option to farmers. The risk to investment, a major reason for limited fertilizer use, is reduced.

Table 1. Change in the capacity of soil to store water (litres/ha) with changes in levels of soil organic carbon (OC) to 30 cm soil depth. Bulk density 1.2 g/cm³

Change in OC level	Change in OC (kg/m ²)	Extra water (litres/m ²)	Extra water (litres/ha)	CO ₂ sequestered (t/ha)
1%	3.6 kg	14.4	144,000	132
2%	7.2 kg	28.8	288,000	264
3%	10.8 kg	43.2	432,000	396
4%	14.4 kg	57.6	576,000	528

Source: www.amazingcarbon.com.au

Table I Shows the increased water holding capacity of soils due to increased organic matter levels. This is very relevant for agriculture in Swaziland where current agricultural practices significantly decrease soil organic matter content and where most rainfall occurs as short heavy down pours and drought is occurring with increasing frequency.

A great percentage (>50) of rainwater is lost by run-off and evaporation and crops suffer from water stress even after a few days without rain. Water balance analyses from rain-fed farming systems in savannah environments of sub-Saharan Africa indicate that only some 15 – 30 % of rainfall on average is used for productive crop growth (Figure 1). However, on farms subject to land degradation, (in the form of structural degradation impeding rainfall infiltration, water holding capacity and plant water uptake potential and in terms of soil fertility decline), less than 10 % of the rainfall takes the productive flow path as crop transpiration. Yield levels in such degraded farming systems, which are systematically subject to management induced dry spells, commonly oscillate between only 0.5 and one ton of grain per hectare in Eastern and Southern Africa. It suggests (i) that there is a large management induced crop water scarcity and (ii) that there is a large potential for upgrading rain-fed savannah farming through improved soil and water management.

Weed management

Weeds compete for water and thus timely weeding helps to increase rainwater productivity. During the dry season deep rooting weeds exhaust the water reservoir in the subsoil. Common weeds in Swaziland include: *Tagetes minuta* (L.) and *Cyperus esculentus* (L.), *Cynodon dactylon* (L.) Pers. and *Cyperus rotundus* (L.), *Tribulus terrestris* (L.) Weeding is therefore a major issue in conservation farming. Farmers tend to identify weeding as their primary concern when discussing a transition from conventional mouldboard ploughing to a system of no-inversion of the soil. Their concern is well founded, and often herbicide use forms an integral part of promoted conservation agriculture systems. Even though results generally show significant economic returns from minimum tillage systems using herbicides, the sustainability of promoting such a system among resource poor farmers has been questioned, due primarily to problems of access and affordability.

The transition from a conventional tillage system to a conservation system has to be carried out progressively (e.g. a 5 year transition). A reason for such a transition is to progressively manage weed infestation and improve the structure and bio activity in the soil. Decades of ploughing with no late-season weeding (thereby permitting weeds to flower and set seed), has resulted in a progressive and in many areas dramatic build-up of weeds. Farmers use ploughing to manage weeds, while simultaneously inducing more weeds due to lack of late season weeding. This is especially the case for weeds which propagate through underground root growth. Farmers get addicted to ploughing as they come to accept it as the only means of weed control. It is common practice even in dry areas of e.g. Ethiopia to use (waste) the first rains only for weed germination. These weeds are then ploughed into the soil. A solution to this is to introduce an additional late season weeding, carried out before seed setting.



Chitica animal drawn planter.



Jab planter.



Tractor drawn Chitica planter.

Socio-economic considerations

Many semi-arid areas in Ethiopia, Kenya and Tanzania experience chronic food shortages not primarily due to a cumulative deficit of rainfall, but due to the land holdings being too small in relation to the number of mouths to feed. In the Ethiopian highlands families try to survive on < 1 ha of arable land per household producing staple food yields of 0.5 to one t ha⁻¹ (maize, teff, sorghum, millet). In such areas farming systems improvements have to focus on producing more - in terms of economic and nutritional returns - per unit soil and water. Farmers will only be ready to change their farming systems and to invest if they can expect higher returns to labour and/or acreage. A precondition is easy access to markets and fair market prices. Introduction of conservation tillage must therefore be closely linked to market considerations, to enable diversification of production, and if possible link conservation tillage to the production of high value crops.

Access to high quality and affordable conservation tillage implements is also a major challenge in remote communal farming areas. Local manufacturing of conservation farming implements for smallholder farmers is carried out in Kenya (for example: Kick-Start) Zambia, Tanzania, South Africa, and to a limited extent in Ethiopia. However, much work remains before all farmers have easy access to affordable conservation farming implements.

Photos showing a range of implements (hand held, animal and tractor drawn) used in conservation agriculture, depending on the level of mechanization. No- or minimum tillage, i.e. non inversion of soil, is the single most important step in the transition from a conventional to conservation tillage.

Annex V. Strategic Questions

Both during project planning and implementation it is very important to ask the following strategic questions:

Why? Why are we doing this activity? This is a crucial strategic question to be asked regularly by individuals and organizations, first to really understand why they engage in doing something and later on as a reminder to keep focused on the objective. This is a very important step in rallying people around a project, plan or even a vision that an organization or a group may have. Once the relative importance of the activity is identified or made known, it is very important that staff fully support the project.

What? What must happen for me to realize that we are on the right track? What ought I see as partial products that indicate the process is on track? Will the annual plan result in achieving the required outputs and outcome or is an adjustment required? By continuing along this set of activities, will I get to the desired destination?

If staff aren't convinced or informed about the "why" and "what" of their project, they will be in the dark regarding the direction of the program or not well aware of the various components of the program and its results be they sequential or simultaneous results. So, staff members need to be aware, convinced, knowledgeable, able and motivated.

Who? Who do I need to partner with to make this happen? This is one of the most crucial components. WV is not an expert at everything and cannot do everything alone. It is good to collaborate and benefit from the expertise of other organizations and individuals and it is imperative to focus on training and facilitation of community responsibility for activities from the outset.

How? How will this happen? This is a lower strategic question but crucial to the realization of the overall vision and goal. This question asks about the activities that determine the implementation stages of the program or its projects. The how will lead to a breakdown of the overall task into its various components and determine required resources, and sequencing and timing of events. Ultimately this will be finalized as a time-bound project plan of action. In a nutshell, this answers the question, "What activities need to be implemented in order to achieve the goal?"

Once an activity is implemented, it is also important to ask ourselves 'so what' and 'why not'. We need to continually critique ourselves so that corrections can be made right away and not at the end of the project. If things don't work in the busyness of WV life, it's too easy to not follow through and correct the problem. But studying the reasons for failure and non acceptance of a new idea and following through with sheer perseverance and by devising alternative strategies may mean the difference between success and failure. When we see problems, we need to ask 'what do we do to overcome them? Importantly, can we instill in lead farmers the same skills of having an enquiring mind? Even if objectives are being reached, it is healthy to be in the habit of asking 'so what'? Is this result cost effective? Is it sustainable? Will it contribute to the desired outcome?

Annex VI. Farmer Managed Natural Regeneration

Following is a brief description of a rapid, cheap and easily replicated method of reforestation called farmer managed natural regeneration. The practice is spreading rapidly in other African countries and has very high potential in Swaziland.



While women walk for more than two hours in order to collect firewood every day the opportunity to grow their own close to their homesteads is bypassed.

If managed through pruning, these stems growing from tree stumps could provide wood for home use and for sale.

In Swaziland many tree species have the ability to sprout from stumps and roots after they are cut down. In fact, thousands of hectares of forest and farmland in Swaziland could be improved through the practice of FMNR.

The basic method of FMNR is very simple. The farmer selects the tree stumps he/she will utilize and decides how many stems will be allowed to grow on each stump, based on the farmers' needs and ultimate purpose of reforestation. Excess stems are then cut. With the remaining stems, side branches are pruned off up to half way up the trunk. A good farmer will return every 2 to 6 months for a touch up pruning and thereby stimulate faster growth rates and produce straighter stems. Pruning is extremely important for stimulating rapid growth of more valuable, straighter stems.

While tree planting is important and can make a significant contribution to reforestation, the advantages of FMNR include low cost, rapid growth, high establishment rate and ease of replication. As with other activities though, farmers need an incentive in order to be motivated to practice FMNR. In other regions, giving farmers either outright ownership of trees or tree user rights has made it possible for large scale community managed reforestation to take place. Many people do not realize the enormous regenerative capacity of this regrowth and think that environmental restoration can only take place through tree planting or that it will take many years to achieve. In fact, where FMNR is possible, tree planting is not necessary and regrowth is extremely rapid. However, FMNR is a proven and widely applied practice in Africa and it has very high potential in Swaziland.

FMNR could make a contribution to environmental restoration and towards increasing incomes. Approximately 36% of Swaziland, representing 6.25 million hectares is covered by indigenous forests and much of this is degraded, secondary growth forest. Because of dense regrowth after removal of valuable trees, productivity of such forests is low, they are a fire hazard, and grazing potential is low. If even a fraction of this area were managed by communities the enhanced conservation value and income generating capacity through sustainable harvest of wood and non timber forest products would be enormous. This income could be generated each year indefinitely while actually enhancing the environment. Additionally, there would be increased livestock production because of the increased availability of fodder from tree seed pods and leaves and increased grass growth.



Vast areas of forested land are currently underutilized and poorly managed. They are gradually being destroyed through illicit harvesting of trees. Through community empowerment and use of tools such as FMNR these areas can be restored while providing a significant boost to incomes. In this way, disempowered landless and female headed households could also benefit.



Secondary growth forests which are not managed are very unproductive. The massive regrowth which occurs after dominant trees are removed chokes out grasses. Stiff competition between plants reduces growth of trees. However, with pruning fodder production will increase and more valuable species will be enabled to grow relatively quickly (Below).



Recommendations

- Empower communities to manage enclosure areas through granting of user rights and formation of cooperatives or other suitable management structures
- Teach and promote the practice of FMNR
- Assess the income generating potential of NTFP management and address any gaps discovered
- Devise a certification scheme for distinguishing between sustainably harvested wood and NTFPs from FMNR managed enclosures

Annex VI I. Benefits from diversification of gardening activities



Diamond Back moth larva (*Plutella xylostella*) eating holes in the leaves.

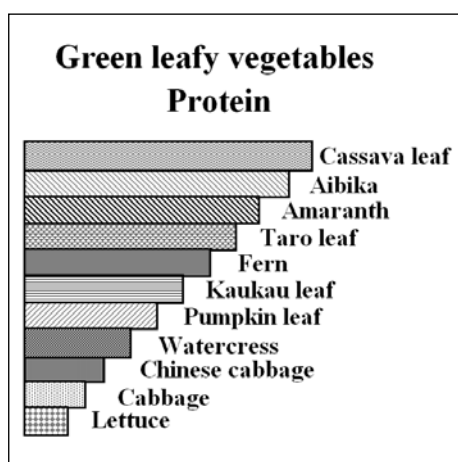


Lettuces have bolted due to high temperature. During the rainy season, farmers' focus is naturally on their rain-fed crops and gardens are neglected as evidenced here by weed encroachment. Through mulching weeds can be suppressed and by planting perennial species such as trees and shrubs, labour requirements and weed impact on production will be reduced.

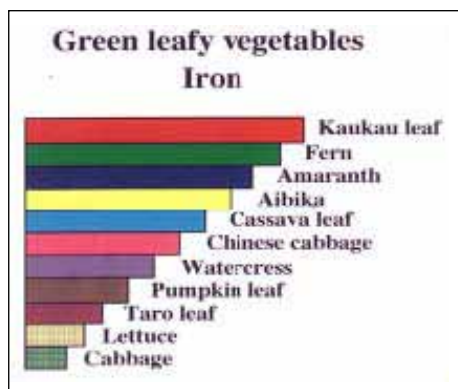
Promotion of vegetable gardening is already bringing many benefits to WVS ADP communities. Success at gardening will increase as farmers gain experience. WVS can also increase the success rate and hence adoption through provision of good training, regular follow up and timely access to technical expertise. Where possible, facilitation of market access for produce will also stimulate production. Gardening with annual plants is proving beneficial but even greater gains can be made through diversification to include species which are highly nutritious, drought tolerant and disease and pest resistant. Through diversification, some of the critical limitations being faced by gardeners can be addressed. In this regard, indigenous and exotic perennial species of edible trees and shrubs are of great benefit. Limitations of annual, temperate vegetable species such as lettuce and cabbage include:

- The need for securing seed and replanting every two to three months, in the face of poverty and labour shortages
- Regular weeding in the face of labour shortages
- Regular watering in the face of water shortages
- Susceptibility to pests and diseases in the face of low access to safe pesticides
- Generally low nutritional benefits in the face of heightened nutritional needs

Miscellaneous tables showing comparative nutrient values between cabbage and selected fruits and vegetables.



Protein is important for building healthy bodies yet protein levels in commonly grown vegetables such as lettuce and cabbage are extremely low in comparison to some other vegetables.



Iron is critical for energy transfers and for carrying oxygen in the human body. Anaemia can be a particular problem for pregnant and lactating women and for children in many African countries. Many plants have 10 to 100 times the iron content of cabbage leaves.

Vegetable	Vitamin A content $\mu\text{g per } 100 \text{ g}$
Carrot	12000
Cassava leaves	11750
Chili leaves	7140
Sweet potato leaves	4000
Blackberried nightshade leaves	3660
Pumpkin leaves	3600
Kangkong	2865
Chinese cabbage	930
Cabbage leaves	280

Vitamin A – important for good eye sight and forms a growth factor.

Nutritional value per 100 gram of various fruits and vegetables.

	Avocado	African leaf cabbage	Cabbage	Papaya	Moringa
Energy	160 kcal	26 kcal			30 kcal
Carbohydrates	8.53 g	6 g	5 g	7.4 g	38.2 g
Sugars	.66 g				
Dietary fibre	6.7 g		2.6 g		19.2 g
Fat	14.66 g	0.1 g	.48 g	.1 g	2.3 g
Protein	2 g	1.7 g	1.15 g	.4 g	27.1 g
Vitamin A		16.7 ug	.117 mg	3270 ug	16.3 mg
Vitamin B1	.06 mg	.04 mg	.09 mg	.03 mg	2.64 mg
Vitamin B2	.13 mg	.04 mg	.08 mg	.03 mg	20.5 mg
Vitamin B3	1.7 mg	.3 mg	.42 mg	.04 mg	8.2 mg
Vitamin B5	1.389				
Vitamin B6	.257		.17 mg		
Vitamin B9	81 ug	75 ug		1 ug	
Vitamin C	10 mg	54 mg	30.15 mg	52 mg	17.3 mg
Calcium	12 mg	47 mg		21 mg	2,003 mg
Iron	.55 mg	.7 mg	.26 mg	.6 mg	28.2 mg
Magnesium	29 mg		12 mg		368 mg
Phosphorus	52 mg		22.5 mg		204 mg
Potassium	485 mg		145.5 mg		1,324 mg
Zinc	.64 mg		.14 mg		

Cabbages (especially the purple variety and especially the darker outer leaves) contain high levels of phytonutrients which work as antioxidants. Diets high in cruciferous vegetables, such as cabbage, are associated with lower incidence of a variety of cancers. Cabbage also benefits the stomach and improves digestion. It is also used for treating constipation and wound healing and the juice can be used for treating stomach ulcers. Cabbage also contains a high content of Vitamin C. Thus there are good reasons to continue growing some cabbage in ADP gardens. Yet, there are other edible trees and vegetables which are easier to grow and more nutritious which deserve attention in WVS garden programs. Following are just a few examples of the wide diversity of hardy and nutritious edible plants which could be promoted.



Moringa stenopetalla growing in infertile soil under high temperature and low moisture conditions in Niger Republic.

Moringa stenopetalla

Moringa is an amazing food and medicinal plant. Moringa can rebuild weak bones, enrich anaemic blood and enable a malnourished mother to nurse her starving baby. Ounce for ounce, it has the calcium of four glasses of milk, the Vitamin C of seven oranges and the potassium of three bananas. A dash of Moringa can make dirty water drinkable. Doctors use it to treat diabetes and high blood pressure. Not only can it staunch a skin infection, Moringa makes an efficient fuel, fertilizer and livestock feed. Moringa has triple the iron of spinach and more impressive attributes than olive oil. And it's not only good for you, it's delicious. Moringa is very drought tolerant, grows in poor soils, requires little maintenance and produces prolific amounts of edible leaves and seed pods yet few farmers grow it at all, let alone in commercial quantities.

Avocado

This hardy tree is virtually self maintaining once established and will produce over two tons of energy rich fruit each year once mature. Avocados are a good source of vitamin K, dietary fiber, vitamin B6, vitamin C, Folate, Potassium and Copper. Although they are fruits, avocados have a high fat content of between 71 to 88% of their total calories - about 20 times the average for other fruits. A typical avocado contains 30 grams of fat, but 20 of these fat grams are health-promoting monounsaturated fats, especially oleic acid. They contain per 100g-11% of the recommended daily intake of vitamin A, 11% of Thiamine, 19% of Riboflavin, 21% of Niacin, 42% of Vitamin C and 13% of Magnesium, to name a few.



Avocado fruit



Marula tree (top), fruit (centre) and seeds (bottom).

Marula tree⁴ The Marula tree which is indigenous to Swaziland produces plum-sized stone fruits. The tree grows vigorously, thriving under high temperatures and tolerating inhospitable conditions. Many are eaten fresh but most are processed into beverages, jams, and jellies. The juice contains up to four times the vitamin C of orange juice. The nut is also eaten and has high nutritive value and good taste. Marula is a good food-security resource - it provides food during the season when grain stocks are low and other annual crops are not yet harvested. The nuts store well, providing nutritious food long after all else is gone, making them a good emergency food store.

The nuts are rich in oil, averaging about 55% to 60%. The oil is high in unsaturated fatty acids, typically containing 70 % Oleic acid and 8 % Linoleic acid. The oil is also used for manufacture of cosmetics and is processed in Swaziland, largely for the export market. The nut also contains considerable amounts of protein (23%-31%) and provides minerals such as Calcium, Magnesium, Phosphorus, and (to a lesser extent) Potassium and Sodium. Rich in food energy, the nut normally contains around 700 calories per 100 g. They are exceptionally nutritious, with 28% -31 % protein, 56% -61 % oil, 2.02 % Citric acid, Malic acid, and sugar, Phosphorus, Magnesium, Copper, Zinc, and B Vitamins (Thiamine and Nicotinic acid). The fruit commonly contains 180 mg vitamin C per 100 g, but the concentrations can go even higher. Carbohydrate levels of between 7 and 16 percent have been recorded in the fruit pulp.

Marula can be extremely productive. In Namibia 4.5 tons of fruit have been measured in single season on a single large tree. This big, leafy tree provides great shade and its fruit, leaves, and bark make excellent fodder. Flowers produce nectar in quantity, making the tree an important resource for beekeepers. The honey is light-coloured with excellent flavour. The wood hardens as it seasons, eventually becoming durable and strong. Although dirty white, with red and brown streaks, it turns a pretty pink when polished. Carvers make it into drums, stamp-blocks, troughs, spoons, stools, bowls, and more.

Propagation via root cuttings is very easy. Such techniques can be used to clone elite specimens as well as to avoid the long juvenile periods that growers of seedlings must suffer. The plant can also be propagated by jabbing sections of branches (2 m long and 10 cm in diameter) 60 cm into the ground during the wet season. If cut at the time of bud swelling they strike readily, putting out abundant roots with speed and vigour.



Fresh fruit must be eaten soon after picking before it perishes. The fruit, which is quite tasty and rich in sugars and vitamins.



Cactus plants growing on stone walls – a clear demonstration of their tolerance to drought conditions.

Cactus pear or *Opuntia* spp., syn. *Nopalea opuntia*

The cactus plant is extremely drought tolerant and will grow on degraded soils, hillsides and wastelands with little attention and is likely best suited to the drier lowveld region of Swaziland. While the fruit is high in sugars and vitamin C, alone it does not provide a balanced diet.

The fruits can be processed into juice, jams, jellies and preserves and the nutritious younger leaves can be eaten as a tasty salad. A recipe is available for making naturally sweet, visually appealing bread which can be stored for some weeks. With scientific investigation, there is potential to develop nutritionally balanced bread using the cactus pear as the base and adding other locally grown ingredients such as vitamin rich moringa leaf and legume seeds.

Good practical knowledge about propagation, maintenance, pest and disease control (although little is needed) and harvesting are available at the Agricultural Resource Councils (ARC) in South Africa and the University of Fort – Hare, near East London, Republic of South Africa.

His divine power has given us everything we need for life and godliness through our knowledge of him who called us by his own glory and goodness. 2 Peter 1:3

Even in the face of recent droughts and declining rainfall trends, Swaziland remains a land with very high potential for food production and sustainable exploitation of natural resources. In a very real sense, Swaziland already has all it needs for physical life – natural resources, knowledge, adequate rains for appropriate crops and high literacy rates. As the scripture says, Swaziland has already been given these gifts. It does not say “VVV will give everything needed for life”, but, God “has given everything...”. This assessment has indeed found that Swaziland has a rich agricultural potential. All that remains is to understand what it is that has been given, how to best use it and then, to use it.

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