Experiences with Micro Agricultural Water Management Technologies:

Zimbabwe

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An input to the Study on Agricultural Water Management Technologies for Small Scale Farmers in Southern Africa: An Inventory and Assessment of Experiences, Good Practices and Costs

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1. INTRODUCTION

1.1. Purpose

The study has been carried out to develop an Inventory of agriculture water technologies and practices in the SADC region. The study aimed to document the practices and technologies used in irrigation especially at micro levels in the region particularly those aimed at improving the livelihoods of the rural poor. It also sought to document the impact, success, adoptability and failures of initiatives of the different approaches by different organization especially those linked to USAID.

The study looked at various organizations which included NGOs and Government departments that are involved in micro irrigation technologies that enhance livelihoods and food security.

1.2. Methodology

The inventory adopted mainly a desk study approach which involved reviewing of literature, reports from different organizations. Interviews were also conducted through face to face and telephone. As for verification field visits to selected sites were conducted.

1.3. Limitations

The main limitation to this study was the lack of documentation. A lot of the information on small scale irrigation schemes, micro technologies and initiatives is available only from the organizations involved in the schemes and can only be extracted through interviews with those individuals directly involved in the initiatives.

1.4. Report structure

This report gives an overview of the water resources and water use in Zimbabwe, analyses the technologies and practices used for micro irrigation in the country, outlines the programs undertaken in the promotion of micro irrigation and describes the main players in micro irrigation development in the country be discusses the potential for scaling up the most promising technologies and practices

2. OVERVIEW OF FOOD SECURITY, HUNGER, AGRICULTURE AND WATER

2.1. Background to Zimbabwe

Zimbabwe is a landlocked country, located in Southern Africa between about 15 and 22° south latitude and 26 and 34° east longitude, with a total area of 390 760 km^2. Zimbabwean soils are derived predominantly from granite and are often sandy, light textured and of fair agricultural potential. However soils with significant clay content and of excellent agricultural potential are also found in all regions of the country. Cultivated area was estimated at 3.35 million ha in 2002, of which 3.22 million ha arable land and 0.13 million ha permanent. Climatic conditions in Zimbabwe are largely subtropical with one rainy season, between November and March. The winter season which is cool is from April to August, while the hottest and driest period is from September to mid-November. Average annual rainfall is 657 mm, but ranges from above 1 000 mm in the Eastern Highlands to around 300-450 mm in the lowveld in the south. Rainfall reliability in the country decreases from north to south and also from east to west. Evaporation varies over the country to a much smaller extent than rainfall. Values of net annual pan evaporation vary from about 1 400 mm in the Eastern Highlands up to 2 200 mm in the lowveld. Only 37% of the country receive rainfall considered adequate for agriculture. For the rest of the country the rainfall pattern is inadequate, erratic and unreliable making supplementary or full-time irrigation a must for successful agriculture.

The total population of the country is estimated at about 12.9 million, of which 64% is rural (2004). The estimated annual growth rate is about 1.02%. In 2002, population access to improved drinking water sources is said to be 100% in the urban areas and 74% in the rural areas.

Currently the economy is not performing well and from 1997 to 2002 the national economy has contracted by more than 15%. Inflation was estimated to be about 160% and direct foreign investment has all but evaporated. Unemployment levels are above 50%.

2.2. Water resources

The southern African climate varies, from tropical rain forests in the north of the region to desert conditions in the south-west (DfID,2003). These climatic conditions make rainfall one of the most important climatological elements in the SADC region. Large areas within the SADC region are very dry and cannot support sustainable human existence and agriculture, especially in the south-western parts of the region. For example Namibia receives an average rainfall of 250mm per year and has an average evaporation of 370mm per year (Du Pissani, 2004). The eastern coastal zones and northern sub-areas (Angola, Malawi, Zambia, Mozambique, Tanzania and parts of Zimbabwe) are relatively wet. In these regions the mean annual precipitation varies from 1,000 mm to 1,600 mm per year, with isolated areas receiving more than 2,000 mm (DfID, 2003).

The inadequate water resources in the region has put many millions of lives at risk of starvation. In 2001 there were 842 million undernourished people in the world including 798 million in the developing countries (FAO, 2003). In Southern Africa,14.4 million people were at risk of starvation in 2003 (World Vision, 2003).

2.2.1. Water resources

Total internal renewable water resources are estimated at 12.26 km^3/year, of which 11.26 km^3 are surface water resources, 6.00 km^3 are groundwater resources, while the overlap between surface water and groundwater resources is estimated to be 5.00 km^3.

Zimbabwe is bordered to the north by the Zambezi River and to the south by the Limpopo River, both rivers flowing into Mozambique. The country consists of the following major river systems which form the basis of the seven river catchments the country has been divided into: Save, Runde, Mzingwane, Gwayi, Sanyati, Manyame and Mazowe. With the exception of the Save and Runde the other main rivers drain into either the Zambezi or Limpopo. The annual potential yield at 10% risk (resources in a dry year of a 10th year frequency) from all river basins in the country has been estimated to be 11.26 km^3/year. This assessment excludes external surface water resources from such bordering international rivers like the Zambezi and Limpopo. Out of this potential yield and allowing for topographical constraints and disparities between locations of storage sites and regions of required water consumption the estimated exploitable yield is 8.5 km^3/year, of which 56% (4.8 km^3/year) is already committed. This leaves 3.7 km^3/year available for irrigation and other sectors.

Dams are the core of significant progress towards the full development of the country's water resources. The government has embarked on an aggressive large and medium size dam construction programme in the country both for irrigation and other purposes. The total capacity is about 103 km^3, but this includes 50% of Lake Kariba on the Zambezi River, which is shared between Zambia and Zimbabwe and which accounts for 94 km^3 of this capacity. Not taking into consideration this shared dam, the total capacity is thus about 9 km^3.

The overall groundwater resource is small when compared to estimates of surface water resources, mainly because the greater part of Zimbabwe consists of ancient igneous rock formations where groundwater potential is comparatively low. The estimated groundwater potential is between 1 and 2 km^3/year. Four aquifer systems of relatively high groundwater potential are known and these are:

- i) The Lomagundi dolomite aquifer which occurs northwest of Chinhoyi, a town about 120 km north west of the capital Harare;
- ii) The Forest sandstone which occurs in the Save, Limpopo and Zambezi basins;
- iii) The Kalahari sands which are widespread in the southwestern part of the country and exploitable groundwater resources are related to the thickness of the sands;

iv) The alluvial deposits which mainly occur in the Save valley where they form a local aquifer, along the Zambezi, Manyame (Mushumbi pools area) and Musengezi rivers (Muzarabani areas).

2.2.2. Water management

At national level the responsibility for the planning, coordination, management of water resources and delivery of water is vested with ZINWA in conjunction with catchment councils. ZINWA is supervised by its parent ministry MRRID. There are seven catchment councils in the country and each is supposed to represent all stakeholders in a given catchment. Irrigation schemes, both smallholder and large-scale commercial schemes, are represented in some of these catchment councils.
In terms of general irrigation scheme management, and water management in particular, the large-scale commercial schemes including estates and plantations are managed and run by their private owners. ARDA is responsible for managing the schemes under its jurisdiction on behalf of the government.

Within the smallholder irrigation schemes three broad types of management can be found: government-managed, farmer-managed and jointly-managed schemes. Government-managed schemes are developed and maintained by the government. Farmer-managed schemes are developed by the government but owned and managed by the farmers with no external assistance. For jointly-managed schemes the farmers and government share the financial responsibility for operation and maintenance. In terms of scheme numbers it is estimated that about 50% of the schemes are farmer-managed, about 32% government-managed and 18% jointly-managed. However, in terms of hectares the government is still managing a bigger area as most farmer-managed schemes tend to be small.

At the level of farmers in smallholder irrigation schemes Irrigation Management Committees (IMCs) have been established as part of encouraging farmer management. The government's policy since 1980 has been to promote farmer-managed schemes where possible. The IMCs have no legal standing and their effectiveness varies from scheme to scheme.

The departments of AREX and DOI play a central role in providing extension and training to the irrigation sector. These departments are represented at provincial level and in the case of AREX also at district level. DOI also has an approved structure that gets to the district level. In most irrigation schemes in the smallholder sector there is at least one full-time extension worker from AREX. Farmer organizations and unions also provide training and extension services to irrigators. The major farmer unions are the Commercial Farmers' Union (CFU), which represents large-scale commercial farmers, and the Zimbabwe Farmers' Union (ZFU), which represents smallholder farmers.

2.3. Water use

Total water withdrawal is estimated at 4.2 km^3 in 2002. Agriculture is the greatest water user in Zimbabwe accounting for 79% of total water use. Agricultural water uses are for irrigation, fish farming and livestock watering. Irrigated agriculture will continue to dominate the water demands for Zimbabwe in the foreseeable future. The irrigation potential for the country is estimated to be 365 624 ha, which takes into consideration only the available internal renewable water resources and not water from the Zambezi and Limpopo border rivers. Water is far a greater constraint than land as the overall area of soils classified as irrigable in Zimbabwe is estimated to be 600 000 ha. The estimate for irrigation potential does not take into account either the economic, technical and social feasibility of further irrigation development.

2.3.1. Domestic water sector

From independence in 1980 Zimbabwe's focus targeted at providing primary water for domestic use to its rural areas where about 69% of population lives. The effort to provide the safe water to the rural areas was characterised by concerted actions of both government and NGOs towards the provision of water and sanitation services being guided by the National Master Water Plan (NMWP) of 1985. As part of the NMWP, the Integrated Rural Water Supply and Sanitation Programme (IRWSSP) was introduced. The IRWSSP is based on the concept of integrating the development of water and sanitation facilities with the promotion of health and hygiene education, the training and capacity building of personnel and institutions, the mobilization of communities, the establishment of sustainable operation and maintenance systems and the transfer of technical and organizational skills and knowledge to user communities. The basic technologies which were promoted included the Bush pump "B type", family wells, deep wells.

2.3.2. Productive water use and agriculture

Agriculture is by far the largest user of developed water in Zimbabwe but however there is no agreed and acceptable pricing. Industrial and commercial water use is not distinguished from urban water supply for domestic purposes. This has been noted a major problem as industry uses already treated water and yet pays very little for it.
Developments in the productive water sector especially the irrigation sub –sector was through both private and public sectors. Private sector supported development for large scale irrigation and was predominant on large scale farms. In the case of communal and resettlement areas the development was limited as the funds were meant to be used for infield works only. Small holder irrigation development has been the primarily responsibility of government through Agritex (AREX) through the support of donors and non- governmental organizations.

The socio economic and political problems facing Zimbabwe has resulted in many hardships, women and children without any means of livelihoods. As a result the majority of the rural population have resorted to small-scale horticultural irrigation projects and market gardening as the only source of livelihood. In Zimbabwe communal lands 70% of the households are engaged in market gardening activities, the majority of these gardens are being managed by women and girl child who handles the majority of the work. A survey carried out by Mvuramanzi Trust revealed that almost 90% of the irrigators are using watering cans and buckets to irrigate. This result in too much labour for the women and girl child and very small area of land is irrigated, at most 0.25ha, the women were operating below potential and sub-economical level perpetuating poverty. The use of watering cans and buckets results in the loss of a considerable amount of water though overflowing and spillages. The other problem associated with watering cans and bucket irrigation system is that it is time consuming and result in considerable productive time loses.

A number of technologies has been developed to address the needs to reduce labour in watering vegetables, while at the same time meeting drinking water needs. The different technologies can be divided into three main categories:

i) wells with pumps
ii) rainwater harvesting technologies
iii) small-holder irrigation schemes.

2.3.3. Recent developments in agriculture

Due to the dualistic nature of Zimbabwean agriculture there is almost no intermediate position between the large-scale and the small-scale farmers. Four broad categories of farming sectors can be identified as far as full or partial control irrigation is concerned in the country. These are:

i) Large-scale commercial schemes: these refer to operations on land owned by private individuals or groups including estates and plantations (80 854ha);

ii) ARDA (Agricultural and Rural Development Authority) schemes: these refer to operations by a parastatal responsible, on behalf of the government, for the operation of government-owned estates and farms, and for agricultural and rural development in rural areas (11 084 ha);

iii) Smallholder irrigation schemes: these refer to a group of farmers irrigating together sharing the same water source and supply line. However there is individual control of irrigation and farming activities by each farmer in his/her plot. Plot sizes are normally 0.1-2 ha (11861 ha);

iv) A1 and A2 irrigation schemes: this is a new breed of irrigators in the country. The land reform undertaken by government has increased the area under smallholder irrigation. The reform has split up commercial irrigation schemes and ushered in two new groups of farmers, namely A1 who irrigate small areas at times with shared infrastructure and A2 who are the breed of commercial irrigators. In some cases, the A2 farmers also share irrigation infrastructure (69 714 ha).

Most formal irrigation schemes in the country depend on water stored in small- and medium-sized dams. Other important water sources are boreholes/deep wells, run of river, shallow wells/springs and sand abstraction systems, which is a technique for extracting water from sand layers in river beds through a network of perforated pipes buried in the river bed which collects water into a sump from which it is pumped.

Opportunities also exist in the country for the cultivation of wetlands or dambos. These cover a national area of 1.28 million ha, of which about 260 000 ha are in communal areas and the remainder in commercial farming areas. Only around 20 000 ha are cultivated in the communal areas. Although local research has confirmed the safety and advantages of dambo cultivation there is still no enabling national legislation and policy to promote the sustainable use of them.

Water harvesting is another important activity in the country. In-situ techniques are the most commonly practiced and are dominant in the drier natural regions IV and V. The most common systems are the use of infiltration pits, tied furrows, dead level contours, potholing and fanya juus. Despite the obvious benefits of water harvesting in the country, as claimed by farmers and researchers, there is still lack of quantitative data on its extent in the country and of local scientific information on how the various techniques are performing.

2.4. Food security

Southern Africa has been threatened with droughts and food insecurity for the past 3years. The region has received less than normal rainfall for the past years of which this has an impact on agriculture which is the major food producing machinery. Apart form the droughts the region has been hit hard with the HIV and AIDS pandemic. This has caused a lot of suffering to the people of the region. UNAIDS estimates that over half of the 28 million people living with HIV/AIDS in sub-Saharan Africa live in rural areas. In Zimbabwe, the 2000 prevalence survey showed that 31.4 percent of pregnant women living in rural areas were HIV positive. Women who listed their residence as "farm" registered a 43.7 percent prevalence rate. Such figures mean that over 1 million people in rural areas have HIV/AIDS in Zimbabwe.

Agriculture is the cornerstone of the Zimbabwean economy and about 60% of the economically active population depends on it for food and employment. Women play an important role in agriculture and it is estimated that 70% of small-scale farmers are women. Zimbabwe is one of the hardest hit country in terms of food crisis. It is estimated that about 3 million are need of food aid. Poverty is widespread in the country with an estimated 70 percent of the population living below the international poverty line of US$2 a day. Food insecurity has been a recurrent phenomenon in Zimbabwe which is a result of combination of factors. Climatic conditions account for the immediate cause of the crisis, with drought and excessive rainfall adversely affecting crop planting and harvesting. The agricultural sector contributes about 17% to the country's Gross

Domestic Product (GDP), 60% of the raw materials required by the manufacturing industry and 40% of the total export earnings.

The major constraint to agricultural production in the country is drought. Whereas in years of good rainfall the country produces enough to feed the nation and enjoys surplus for export, in years of drought the reverse is the case. About 80% of the land area lies in Natural Region III, IV and V where rainfall is erratic and inadequate, making rain fed agriculture a risky venture. In these areas irrigation is a prerequisite for successful crop production.

3. ANALYSIS OF GOOD PRACTICES IN MICRO IRRIGATION AND RWH

3.1. General

Agriculture is the cornerstone of the Zimbabwean economy and about 60% of the economically active population depends on it for food and employment. Women play an important role in agriculture and it is estimated that 70% of small-scale farmers are women. A variety of technologies have developed and some others adapted to draw water from groundwater sources.

3.1.1. Sources of technology

The technologies used in Zimbabwe are mostly imported technologies even though commendable effort has been made for adapting most technologies to local conditions. Technologies has been adopted form countries such as India, America and organizations such as NGOS have changed these technologies to suite local conditions.

3.1.2. Water sources

Most micro irrigation projects in Zimbabwe, particularly drip kits, draw their water from groundwater sources mostly shallow family wells for individual households and boreholes for community schemes. The conventional irrigation systems such as sprinkler are based mainly on stored surface water.

3.1.3. Service provision

Most small scale irrigation schemes in the country are government designed but donor sponsored through NGO initiatives or government to government agreements. Operations and maintenance costs are usually borne by the scheme users even though some of these costs such as electricity and diesel are heavily subsidized by the government.

3.1.4. Performance

Most of the small-scale irrigation technologies have performed viably due to different uptake and water availability. In the dry regions of the country drips have performed well as compared to wetter regions of the country where there is abundance of water and farmers still practice methods that do not conserve water.

3.1.5. Costs

The operation and maintenance for most systems solely done by Government, agreement is that for the first four years Government buys the parts and does the maintenance after which the farmers have to buy their own parts and government only assists with the repairs.

Table 1 – Capital and operation costs of irrigation in Zimbabwe

Description		Costs in USD
Capital Costs	Drip Irrigation Kits	Range from 25 to 36
	Surface	10 000/ha
	Sprinkler	8 500/ha
Running Costs	Surface	375/ha/yr
	Sprinkler	500/ha/yr
	Drip (commercial)	250/ha/yr

Source: FAO

3.1.6. Contribution to welfare

It is generally agreed by the government, donors and end users themselves that micro irrigation contributes towards income generation. The Drip kits distributed to vulnerable communities have contributed immensely towards food security at a household level.

Small scale surface and sprinkler schemes have also contributed towards household income. The drawback has been that it has not always been possible to quantify this economic contribution. However most end users claim that after joining the schemes they are able to send their children to school, pay for medication and maintain reasonable livelihoods standards.

3.1.7. Environmental impacts

Surface water in Zimbabwe is usually of good quality for irrigation: generally conductivity is less than 500 micro siemens/cm. Groundwater on the other hand tends to be more variable in quality, with some being saline, sodic or saline sodic. The current knowledge on the quality of groundwater in the country is limited. Chemical analyses of water are done before the implementation of drip systems but are rarely done for surface and sprinkler systems.

Poor drainage and salinity are not a major problem in irrigated areas in Zimbabwe, although it has been observed in some schemes under surface irrigation and it is normally associated with poor land leveling and poor water management or the use of poor quality irrigation water.

There is a general increase in the use of agrochemicals under irrigation in the country due to the intensification of crop production. It is thought that the regular use of commercial levels of agrochemicals is an occupational risk for irrigation farmers and increases the risk of contamination of both surface water and groundwater resources. However, data on water analysis showing agrochemicals levels in natural water sources in Zimbabwe are not obtainable and it is thus difficult to establish the extent of pollution due to irrigated agriculture.

3.1.8. *Enabling environment*

Several attempts have been made to formulate an irrigation policy for the country as evidenced by the writing of the Derude Policy paper on small-scale irrigation schemes (1983) and the FAO Irrigation policy and strategy document (1994). However none of these documents have been formally endorsed by government as policy on irrigation development.

The policy paper on small scale irrigation had the following objectives:

(a) To serve as food security in grain deficit areas of the country where decent crop harvest is achievable once every 4-5 years.

(b) To reduce inter-regional movement of grain in food deficit areas where transport costs are exorbitant

(c) To utilize suitable available soil resources through the maximization of a limited water resource for the benefit of communities and individuals.

(d) To provide employment opportunities for communities living particularly in drier regions of the country through irrigation.

(e) The overall objective is to supplement dry land agriculture and therefore “comma Hectare” plots can be justified.

(f) To generate employment and raise income levels of the rural poor through irrigation, agro-industries, trade and commerce, cottage industries and ancillary services.

(g) To serve as vehicles for the introduction and adoption of new and improved techniques by the irrigators in such field as conservation, crop rotation , livestock management, etc

3.1.9. *Water legislation*

The Water Act [Chapter 20:25] (1998) has reformed the water sector to ensure a more equitable distribution of water and stakeholder involvement in the management of water resources. Water now can not be privately owned. The “priority date water right system” has been replaced by water permits of limited duration which will be allocated by catchment councils. Water is now treated as an economic good and the "user pay principle" applies. Pollution of water is now an offence and the "polluter pays" principle applies;

The Zimbabwe National Water Authority Act [Chapter 20:25] (1998) led to the establishment of ZINWA, a parastatal responsible for water planning and bulk supply. ZINWA plans and manages water resources on a catchment basis and involves all stakeholders. Other responsibilities include the management of the water permit system, operationalization of water pricing, operating and maintaining existing infrastructure and executing development projects. The parastatal works with seven river catchment councils to which it will devolve responsibility for managing river systems and enforcing laws and regulations at the local level.

3.1.10. Financing

Large-scale commercial irrigators, including estates and plantations, source funding for irrigation development privately. However irrigation development for ARDA, smallholder irrigation schemes and dam construction by ZINWA has been traditionally provided by government through funds allocated under the Public Sector Investment Programme (PSIP). The government has also set up a credit namely the Agricultural Development Assistance Fund (ADAF) which is administered on behalf of the government by AGRIBANK, a commercial bank. ADAF offers credit for agricultural projects including irrigation development, but is charging concessionary interest rates. Both large and small farmers can borrow from this fund.

Dam construction costs are unusually high and from time to time the government has shared the cost of particular storages with private investors who have received special allocations in return for their contribution. Until recently, irrigation development in the smallholder sub-sector has also received substantial financial support from donors and non-governmental organizations (NGOs).

3.2. Drip kits

The kits are low-cost, easy to assemble and manage. They do not need high quality water, providing the water is filtered. A 20 litre bucket with 30 metres (100 feet) of hose or drip tape connected to the bottom. The bucket is placed at least 1 metre (3 feet) above the ground so that gravity provides sufficient water pressure

to ensure even watering for the entire crop. Water is poured into the bucket twice daily and passes through a filter, fills the drip tape and is evenly distributed to 100 watering points. The multi-chambered plastic drip tape is engineered to dispense water through openings spaced at 30cm (12 inches). Two bucket kits costing around $20 will produce enough vegetables for a family of seven and can last over five years. The system is most suited to kitchen gardens. As well as the bucket, you will need several strong poles, tools, manure, water and vegetable seedlings. The poles are used to make a support structure.

3.2.1. Technical description

Low cost drip kits have been provided through various initiatives. The kits range in size from small gardens of 10 m x 10 m and 30 m x 30m to small plots of up to 4 000 m2. The water source for the drip kits in Zimbabwe has been the groundwater particularly family wells and boreholes. The drip system requires water of low turbidity to avoid blockages and needs a small head for flow. For these reasons coupled with the costs incurred in treating surface water and the energy to raise the head means surface water has been excluded in the promotion of the drip kits.

3.2.2. Source and origin

Most drip kits in Zimbabwe come from Israel via agencies in S. Africa. In the early days of drip kit promotion, a piloting phase was initiated in which kits from different supplies were tested in the field. The University of Zimbabwe Department of Civil Engineering documented the performance of kits from Israel (two types), from India and one locally assembled. The piloting experiments recommended use of the Israeli kits on technical efficiency but also recommended the locally assembled kit. The drawback of the local kit was the failure of the local manufacture to meet the required demand.

Figure. 1. A drip kit photo

3.2.3. Extent of use

The drip kits have been promoted for individual households, schools and community groups particularly in the drier parts of the country (annual rainfall between 300 and 500 mm per year) but of late promotion has targeted the urban poor for the development of nutrition gardens. This has been necessitated by the realization that good nutrition has helps in alleviating the effects of AIDS and also because the drip kits reduce the labour and energy requirements for crop production.

To date drip kits have been promoted in all of Zimbabwe's 10 provinces regardless of the climatic or socio-economic conditions.

3.2.4. Operation and maintenance

A capacity building program has been instituted wherever drip kits have been promoted in Zimbabwe to enable the communities to handle routine O&M and repair work. The main problem has been with the installation of the kits. In most cases the funding agent relies on an intermediary NGO to acquire and install the drip kits in the communities. Often the NGO personnel were not well trained themselves or delayed unnecessarily the installation of the drip kits such that by the time they install them the community persons tasked with O&M will have lost interest or simply forgotten what they were taught.

3.2.5. Level of community involvement

In most cases the community, particularly the rural and urban poor, have been passive participants on the drip kit initiatives. NGOs have done more to identify the communities in need, supply and install the kits. Thus the role of the communities have been limited to accepting, running and routine maintenance of the installed systems.

The wealth rural, schools and in some cases rural clinics, have often taken the initiative to source kits for their households.

3.2.6. *Costs*

Purchase costs under the LEAD program were estimated around USD30 in 2002. Operation costs are usually higher by about 20% to 50%. The cost of a 10 m x 10 m drip kit ranges between USD$25 – USD $36

There are also hidden costs for capacity building, particularly the training of field officers and community members themselves as well as for running the initiatives such as the LEAD program in Zimbabwe. Such costs are seldom quantified.

3.2.7. *Effectiveness of technology/practice*

The drip kits have in a majority of cases improved the lives of the users. Users applaud the use of less water which means less trips to the well thereby freeing time for other household chores. Many users report an increase in crop yields as well. It must be noted that users of drip kits in the rural areas do not abandon their traditional gardens, rather they take drip as a parallel activity. The users who praise drip kits the most are usually those who did no have alternative gardening activities (or general livelihood sources in some cases) before such as the urban poor, the orphans and vulnerable children.

However skeptics remain, especially those not involved in the program from its inception. Among their complaints are that the practice is not culturally sound (no reasons are offered for this argument) and that it disrupts the way things ought to be done (again it is not clear what is it that ought to be done).

3.2.8. *Suitability*

The technology is suitable for all physical environments and can be used by all socio-economic groups. The limiting factor remains the availability of water. Rainfall in Zimbabwe is seasonal and most shallow wells dry up in the dry season. As a result some of the gardens established for drip kits will not be operational in the critical months of October to November before the main rains fall and groundwater is recharged again.

3.2.9. *Environmental benefits*

Drip kits result in less water being used for irrigation thus more water is available for the environment.

3.2.10. *Advantages*

The observable advantages are less water is used, time is freed for other household tasks, less energy is needed for watering of the gardens and nutrition vegetables are grown in-situ.

3.2.11. *Disadvantages*

Disadvantages come in areas of where there is abundant water and farmers see no incentive to use the drip. The other problem is the clogging of the pipes when the water quality used is poor.

3.2.12. Cultural acceptability

Most communities have taken a liking for the technology.

3.2.13. Potential for up scaling

The communities have bought into the technology and the task is to transform the use of drip kits for food security and livelihoods to a more developmental thrust. There is need to create the commercial linkages that allow market forces to drive the acquisition and use of drip kits.

Currently in Zimbabwe the use of drip kits is initiated by NGOs and donor agencies such as USAID and DIFID. These organizations promote drip kits as a food security measure not a developmental one. As a result the middle class that may need micro-financing support to acquire and use drip kits and the upper class that have their own resources do not have access to cheap kits.

The water and environmental laws in the country recognize the importance of water saving techniques as such drip kits are in a favourable position and will be encouraged by the national government. The enabling environment for up scaling the use of drip kits exits and is waiting to be exploited.

3.3. Treadle pumps

The treadle pump is a low-lift, high-capacity, human-powered pump designed to overcome these obstacles. The treadle pump can lift five to seven cubic meters of water per hour from wells and boreholes up to seven meters deep as well as from surface water sources such as lakes and rivers. It was invented in the late 1970s by Gunnar Barnes, a Norwegian engineer working for Lutheran World Federation in Bangladesh. In the mid-1980s, Daniel Jenkins of the United States Agency for International Development (USAID) developed a PVC version of the treadle pump capable of delivering water under pressure. In 1987, Appropriate Technology International engineer Carl Bielenberg modified the Jenkins version so that it could be manufactured in the small metal workshops typically found in Africa.

Treadle pumps were first introduced in Zimbabwe in the late 1980s, through a project whose objectives were to compare the effectiveness of manual waterlifting devices. Treadle pumps were imported from Bangladesh and later modified to suit Zimbabwean conditions. The permeable nature of the soil in many parts of Zimbabwe means that unlined earth channels have unacceptably high infiltration losses. The pump was therefore modified by the addition of a spout to allow discharge into a small tank from which water could be piped to the crops. The type of permanent field installation used in Bangladesh was unpopular with farmers in Zimbabwe, because the pump could not be taken back to the house at the end of the day for safekeeping. In 1994, treadle pumps were introduced to the communities through the Appropriate Technology project.

3.3.1. *Technical description*

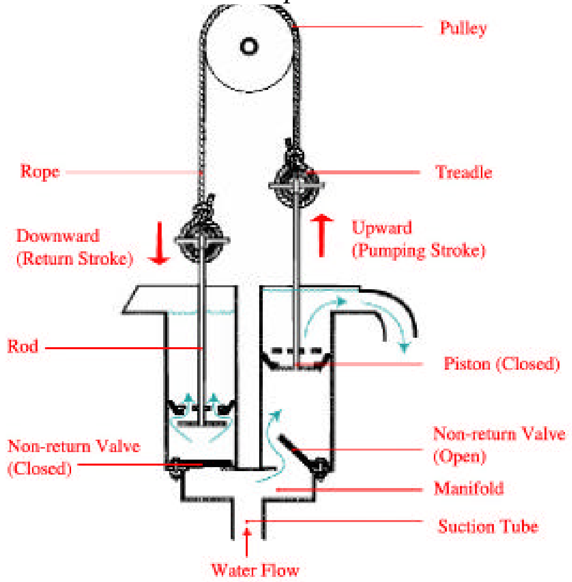

Figure 2. Diagram of a treadle pump: (Adopted from FAO)

A treadle pump comprises a cylinder fitted with a piston and some means of pushing the piston up and down (Figure 2). A pipe connects the pump to the water source and at the end of this pipe is a non return valve that allows water to enter the pipe and stops it from flowing back into the source. The piston and the cylinder must have a very close fit, so that when the piston is raised, it creates a vacuum in the cylinder and water is sucked into the pump. When the piston is pushed down, the water is pushed through a small valve in the piston to fill up the space above it. When the piston is raised again, it lifts this water until it pours out over the rim of the cylinder and into an irrigation channel or tank. At the same time, more water is drawn into the space below the piston. The downward stroke of the piston once again pushes water through the small valve into the space above the piston and the process is repeated.

3.3.2. *Extent of use*

An artisan was approached in Masvingo to produce a pressure pump for an NGO, CARE International. This artisan is now the biggest manufacturer of the treadle pumps in Zimbabwe, having produced in excess of 600 units for the local and export market. Masvingo province has the highest number of treadle pumps as a result of promotion of the technology by NGOs.

Although treadle pump technology is ideal for the rural poor communities, it is not widely distributed because of a number of limitations. Engineers, planners and extension staff have been reluctant to consider human-powered pumps for irrigation. This reluctance seems to be based on moral, technical and economic grounds. It is argued that it is immoral to propose solutions that force people into hard physical labour and in most cases the technical and economic justification is very poor. At the moment, treadle pumps are well known in Zimbabwe but no one has marketed them on a wide scale and production is not continuous. The distribution of treadle pumps is further constrained by the fact that water tables are very low – deeper than 6 m – in most areas. Most communal areas are located in the driest parts of the country and where the water tables are deepest.

3.3.3. Operation and maintenance

Many treadle pump users complained about difficulty in priming pumps. This consumes a great deal of their energy, so much that some of them give up the whole process. A non-return valve is needed at the entrance to the suction pipe to solve this problem.

Pumps are sold without any suction or delivery pipes. Farmers must find their own source of pipes. These should be supplied with the pump. It will increase the unit cost of a pump but it should reduce the problems the farmer faces in getting the right pipes and fittings and greatly improve customer satisfaction.

3.3.4. Level of community involvement

Limited community involved due to its limited distribution. More than half the pumps were provided to communities through projects, which implies that they were donated; hence they are community property. It is very difficult to mobilize the community to put together the funds for maintenance, regardless of the amounts involved. It has been observed that individually owned pumps (household property) are much better maintained than community-owned pumps (common property).

3.3.5. Costs

The imported treadle pumps tend to cost more than the local ones. However the unit costs are difficult to deduce because most were provided in the context of national programs for which supplies were obtained in bulk. Though cheaper the local units are usually made of inferior strength materials have a shorter lifespan than the imported versions.

3.3.6. Effectiveness of technology/practice

Treadle pumps are mostly used for irrigation of small vegetable gardens. Water is pumped from shallow wells, streams or small dams into a tank and then piped to the crops. The pumps are also being introduced on existing large-scale surface irrigation schemes for specialized horticultural production under drip irrigation. A local drip irrigation company has developed a kit that can work in conjunction with a treadle pump. Although the kit is still being tested at the Zimbabwe Irrigation Technology Centre, it has been found to be very popular with farmers at the Ngondoma irrigation scheme, where they have been contracted by a canning company to produce highgrade tomatoes. The other main crops grown using treadle pumps are rape, cabbage, onion, carrots and green beans.

3.3.7. Suitability and cultural acceptability

Some farmers have not been comfortable with the pumps, saying that operating the pumps was tiring. There are also some interesting social implications of treadle pump use. The pumps are mostly operated by women and children, as all work in the garden is usually the preserve of women. Because an operator is elevated above the ground, women do not feel comfortable standing on the pumps for long periods. They feel more exposed, because their dresses can be blown by the wind, revealing some hidden parts of their bodies, which they consider undignified. The second and more sensitive aspect came from the men, who felt that treadle pumping was making their wives overtired.

3.3.8. Advantages

Treadle pumps are mostly used for irrigation of small vegetable gardens. Water is pumped from shallow wells, streams or small dams into a tank and then piped to the crops.

3.3.9. Disadvantages

Many treadle pump users complained about difficulty in priming pumps. This consumes a great deal of their energy, so much that some of them give up the whole process. The cost of the pump is also prohibitive.

3.3.10. Potential for up scaling

There is potential for scaling up but the following has to be addressed for it to succeed.

i) Make the pumps affordable
ii) sell to individual farmers
iii) do not give subsidies since most have been donations and there is lack of ownership.
iv) The product should be viable since there has a lot breakdown report of the pump

3.4. Rope and Washer pumps

The rope and washer pump is a simple hand operated pump invented in Nicaragua but was developed in the UK in the 1982 and was adopted and further developed for use in the 90s in Zimbabwe. The pump was tried on a small scale in UMP district and could not be developed further because of the low water table that existed in that district.

3.4.1. Technical description

Head work pillar

Head work pillar consists of treated 150mm diameter poles of length ranging between 1m to 5m depending on the highest point where the water is to be delivered. The headwork pillars may be built with burnt bricks to a thickness of 9inch square.

Wind-lass pulley

The major feature of the rope pump is the windlass, which is fitted in the centre with a rubber wheel. The wheel diameter ranges from 12 inches, 13 inches, and 14 inches to 16 inches depending on size of car tyre available (remember car tyres are specified in inches). The smaller the diameter, the lighter the system becomes. This can be commercially made using a 20mm to 25mm diameter, solid steel rods hardened to maximum strength.

Rotational joint

This is the rotational moving joint of the pump where the hand-lass pulley rotate on the pillars The rotational joint may be fixed in the pillars where hood or brick pillars are used or may be metal plate bushes or bearing which would be fastened to the handles of the pulley.

Rope and washers
A 4mm or 5mm nylon rope is used. Rubber washers are tied along the rope 40cm apart. For shallow wells less than 6metres in depth washers can be 30cm apart to increase delivery. For depths between 6 meters and 12 meters rubbers should be 40cm apart so that the system is not too heavy. The diameter of the washer is dependent on the size of the poly or PVC pipe being used.

Down pipe
Usually PVC or poly pipes are used, the diameter and length of the pipe is dependent on the depth of the well.

PVC Rising Main: A 32mm class 6 or 10 pvc rising main is fitted to the anchor block and should be long enough to protrude about 2 metres above the concrete slab so that the pump can pump water into a tank positioned one metre above ground.

Rope guide
Is a simple device that is installed at the bottom of the water source to guide the rope into the poly or PVC pipe. The guide come in all sorts of designs and makes with the more modern one made of galvanised wire rods, another home made one is made of plastic container, empty bottles etc. The guide should be cast in a concrete block for stability and immersion into the water.

Anchor block:
The anchor block is composed of a smooth surface material like bottle or Chibuku scud embedded into concrete. A short piece of 32mm PVC pipe is attached to one side of the block. The pipe will be used for attaching the rest of the rising main. The anchor block, which sits at the bottom of the well, is also used to stabilise the rising main.

Gum Poles:
Two gum poles are used to hold the windlass in position. The height of the poles depends on the elevation required. The height of the poles determines the elevation of tank above ground level. A tank positioned one metre above ground has sufficient pressure to operate the normal garden sprinkler. Recent developments in Zimbabwe have replaced the gum poles with brick pillars.

How the Rope Pump works:
The rope is looped round the anchor block and pulled up the rising main. At the top the rope is looped around the wheel and the two ends are then tied together. The rope needs to be fairly tight so that when the wheel is turned, the rope turns as well. When the rope turns, the washers rise inside the PVC pipe and in the process each washer picks up a column of water and creates a suction effect below. The captured column of water is released as soon as it gets to the wider end at the top of the rising main, from there the water is then directed in the holding tank. The suction effect thus created in the pipes

continues to pull more water into the vertical PVC down pipes. The wider end of the rising main should be slightly above the top of the tank. The efficiency of the pump to a great extend depends on how well the washers have been cut. If they are evenly round and tight fitting inside the pipe, then the system becomes more efficient than when they are a loose fit.

Figure 3. A photo of a rope and washer pump (courtesy IWSD)

3.4.2. Extent of use

Mvuramanzi Trust adopted and developed the pump and made further scaling up of the innovations in a number of districts including Marondera, Zvimba, Madziwa, Hurungwe, Beitbridge Chipinge, Buhera, Mudzi and Zvishavane, Mount Darwin and Chirumhanzu district where more than 600 rope pumps have been installed.

3.4.3. Operation and maintenance

It is low cost in terms of O&M and this is done at household level that injects resources.

3.4.4. Level of community involvement

A lot of community involvement in the installation and operation. Recent developments have enabled the water to be delivered into the house for the purpose bathing, laundry and kitchen use.

3.4.5. Costs

Because of locally assembly, the costs of this technology depend on the availability and costs of the local materials and labour. On average a unit may cost between USD100 and USD200.

3.4.6. Effectiveness of technology/practice

On average, the rope pump delivers 200 litres of water every 4 or 5 minutes, depending on the speed at which the wheel is turned, the higher the speed the higher the delivery. It has also been noted that there irrigation potential and can irrigate up to 1 hectare at above given parameters. The irrigation potential decreases with increase in the depth of well and total lifting head.

3.4.7. Suitability

The rope pump (rope and washer pump) is very suitable because its designed is to pump water from traditional family wells, rivers or small ponds for irrigation purposes. Lining the well from the bottom right up to the top is usual done to avoid collapsing and minimize contamination.

3.4.8. Environmental benefits

No degradation of the environment has noted.

3.4.9. Advantages

Some of the advantages are that:

- Social acceptability is high in areas where it has been introduced
- It can be manufactured by the users which makes installation cost affordable
- Repair and maintenance is very simple and can be done by the family
- It uses locally available materials can be produced in the locality.
- Comparatively low cost when compared with other lifting hand pumps such as Bush pump
- Reduces irrigation labour when compared with bucket and can system
- Help to increase area under irrigation and consequently production
- Simple to operate
- Maintenance required is easily grasped by village level mechanics
- Spares are readily available in local hardware shops within rural areas
- The rope pump has a much higher delivery rate than most hand pumps
- Rope pumps are user friendly and are easily managed by women and youths
- Adaptable to different situations like pumping from vertical wells or inclined to pump from rivers or ponds

3.4.10. Disadvantages

The main disadvantages are that:

- It can actually be very strenuous to the user particularly women and children if it is poorly designed and aligned.
- The rope can only operate to a limited head and depth it can only take water from a certain depth and up to a certain height

3.4.11. Cultural acceptability

It is culturally acceptable.

3.4.12. Potential for up scaling

To date the pump has been modified adopted and developed to an advanced level where the operational efficiency has been improved remarkably. Its impact in areas where it has been introduced gives it the scope for further scaling up.

Table 2 below summarizes the most common micro irrigation technologies and practices found in Zimbabwe.

Table 2: Most commonly used micro technologies and practices in Zimbabwe.

Technologies /practices	Source of technology	Source of water & access	Energy requirements	Service provider	End user
Conservation techniques such as zero tillage and mulching	local	Rainwater	Nil	-	Individual community members
Water harvesting (dams) Use of gravity fed systems Drip kits	imported	Surface		Private company NGO	Community
Drip irrigation Promotion and provision of drip kits to farmers and in school gardens.	imported	groundwater	manual	NGO	community
Bucket irrigation	Self design	Surface and groudwater	manual	-	community
Roof catchment	Imported modified	Rain water		NGO	Individual community members
Underground water tanks	Imported modified	Rain and surface water		Private company	“
Water conservation contours Infiltration pits	local	Surface and rain water	Nil	-	“
Elephant pump	Locally designed	groundwater	Manual	NGO	community
Sprinkler system	imported	groundwater	Diesel/petrol/electricity	Private company	community
Treadle pumps	imported	groundwater	manual	NGO	community
Sand abstraction Gravity fed system and sprinkler systems	local	surface	Diesel/petrol/ electricity	private	Local communities/private
Rope and washer pump	Local	Groundwater mainly family wells.	manual	NGOs, Mvuramanzi and IWSD	Individual households often the wealth rurql because of the self financing approach in promoting the technology.

4. SUMMARY OF KEY ACTORS IN MICRO IRRIGATION AND RWH

4.1. Introduction

Several government institutions, parastatals and other non-governmental organizations are involved in irrigation and water management in the country.

4.2. The government

At national government level major institutions involved in irrigation are the Ministry of Agriculture and Rural Development (MARD),

4.2.1. The Ministry of Agriculture and Rural Development (MARD)

The Ministry of Agriculture and Rural Development (MARD) is responsible for the overall development and implementation of the Government's policy on agriculture and irrigation. The Ministry is directly involved through its departments and parastatal bodies as follows:

- ?? The Department of Research and Extension Services (AREX) provides extension services to all irrigators and its research section is responsible for soil surveys and testing for irrigation development;
- ?? The Agricultural and Rural Development Authority (ARDA) is a parastatal responsible on behalf of government for the operation of government-owned irrigated estates and farms. It works closely with the Department of Irrigation;
- ?? The Department of Irrigation (DOI) is a new department which was initially in the Ministry of the then Rural Resources and Water Development (MRRWD) and was recently moved to MARD. The Department is mandated with all the irrigation activities in the country which include planning, identification of schemes, designing, construction, operation and management of existing irrigation schemes
- ?? The Ministry of Rural Resources and Infrastructural Development (MRRID) is the custodian of water rights and develops policies on water development. Three departments and one parastatal under this ministry are involved in irrigation and water:
- ?? The Department of Water Development (DWD) is in charge of the overall formulation of national policies and standards for the planning, management and development of the nation's water resources. It acts as a policy and regulatory unit on water within the Ministry;

?? The Zimbabwe National Water Authority (ZINWA) is a water planning and bulk supply parastatal which works with Catchment Councils to which it will devolve responsibility for managing river systems and enforcing laws and regulations at the local level The organization plays an important role in the management of the water permit system and the operationalization of water pricing;

?? The District Development Fund (DDF) provides tillage services to irrigators and offers a nation wide public works facility for maintaining public infrastructure including boreholes and small dams. The department also plans and construct small irrigation schemes, but under the supervision of DOI;

?? The Ministry of Local Government, Public Works and National Housing is a lead ministry through the Rural District Councils in mobilizing the local community, farmer selection and irrigation plot allocation in smallholder irrigation development;

?? The Ministry of Finance and Economic Development has a key role in defining priorities and in determining the availability of resources for development activities such as irrigation. It also coordinates externally sourced development finance for irrigation and relations with donors.

4.3. Non-governmental organizations (NGOs)

At Non Governmental level various organisations are involved in promoting Small holder irrigation development. A number of technologies have been developed to address the needs to reduce labour while at the same time low cost and as well meeting drinking water needs. There are a variety of different technologies that have been promoted in Zimbabwe but this report will focus on three best practices:

- Drip kits
- rainwater harvesting technologies
- Treadle pumps./Elephant pumps

In Zimbabwe organizations such as IDE, Lead programme, Care International, World Vision, FAO through its implementing partners and Mvuramanzi Trust have been promoting drip irrigation at household level, clinics and schools. Majority of the drip kits cover 100m2. These organizations have been effective in the promotion of the drips kits. To date an estimated 10000 kits have been distributed in 53 of the 57 districts of Zimbabwe. The capital costs of the lower version of drip kits has been estimated to be between US$25 –27 whilst for the higher version is US$36. Research has estimated that the life span of drip kit in Zimbabwe is between 7 – 10 years but this is dependent on the operation and maintenance.

In terms of income generation research by Lead programme revealed that with a drip irrigation households were able to do 3 cycles of crops per year and this translated to average income of US$60 per annum of which this came from the 40% that was sold. The money that was got was used to purchase other food stuffs, medicines, fees, domestic assets such as goats and chicken.

NGOs have been very influential and active in promoting the kits. The NGOs have managed to transfer the technology to community through the involvement of the local extension workers such as those from Arex. Scaling up of the technologies has already started in Zimbabwe with organization such Goal, Practical Action (formerly ITDG) Mvuramanzi Trust giving technical assistance in the promotion of localizing the technology in the districts.

In the same vein IDE implemented a project on Micro Irrigation Partnership for Vulnerable Households (MIPVH). The project aimed to strengthen the capacity of 12000 vulnerable communal farmers in at least seven districts of Zimbabwe to increase food production of nutritionally rich plants by the year 2006. These are households hard hit by HIV/AIDS, drought, and other factors that have negatively affected agricultural output.

The project provided drip irrigation technology and build capacity to conserve and efficiently use scarce water resources and to provide vegetable and herb seeds and fertilizer together with necessary training so that households can establish productive vegetable gardens for home consumption with opportunity to sell surplus production. For this project IDE went into partnership with other NGOs such as AFRICARE, The Zimbabwe Red Cross, Zimbabwe Women's Bureau.

Local community/individual initiatives

In Zimbabwe local initiatives to improve food security especially in the poor urban set up is being spearheaded by the Bulawayo City. The City is in a process of developing a policy on Urban Agriculture and Bulawayo being an arid area irrigation will be through the use of wastewater. In Bulawayo a programme has started, which uses treated wastewater for irrigation. The beneficiaries to the land that was allocated by the city are the elderly, the disadvantaged especially those affected by HIV and AIDS. Majority of the crops being grown to date include maize, beans, Chomolia (vegetable) and these are being grown throughout the year.

Table 3: Summary of main actors in micro irrigation in Zimbabwe.

Name of NGO	Physical Address and tel numbers	Website	Project in irrigation for livelihood support : technologies and support	Contact person	Technologies /practices promoted
International Development Enterprise (IDE)	No 4 Stour Road, Vainona, Harare. (04) 851191/3	www.ide-international.org	Water provision for poverty alleviation.	Mkula Makasa	Treadle pumps and drip kits.
Zimbabwe Trust	3 Allan Wilson Ave Belgravia Harare (04) 792625/ 732254	info@art.org.zw	Conservation Agriculture	Mr. Nyakaza	Conservation techniques such as zero tillage and mulching
Environment Africa	3 Durham Road Avondale West Harare (04) 339691/302886	eafrica@utande.co.zw	Water Harvesting in Lupane, Zvimba and Manicaland	Mrs June	Water harvesting (dams)
Goal Zimbabwe	22 Cleveland Avenue, Milton Park, Harare 798603/5	goal@mweb.co.zw	Agriculture Recovery and Rehabilitation in Hurungwe and Makoni District.	Mr Justin Mukeiwa	Provision of inputs to farmers Training in conservation agriculture Training of maintatainance of open pollinated varieties Promotion of production of fruit trees and sweet potatoes Promotion and provision of drip kits to farmers and in school gardens.
Zero international	158 Fife Avenue, Greenwood Park , Harare (04) 791333/732858/700030	zero@harare.iafrica.com/info@zero.org.zw	Provision of sustainable livelihood through use of renewable energy	Mr. Chigwada	Drip irrigation
Care International	8 Ross Avenue Belgravia,Harare (04) 727986-8/708115/708047	carezim@icon.co.zw	Household livelihood and community resources Management programme .	Mr. Godfrey Mitti	Water harvesting (dams) Utilization of gardens Community mobilization Use of gravity fed systems Drip kits Bucket irrigation
Christian	121 Herbert Chitepo	ccarenat@cst.co.	Rain Water Harvesting	Mr. Chandomba	Roof catchment

Name of NGO	Physical Address and tel numbers	Website	Project in irrigation for livelihood support : technologies and support	Contact person	Technologies /practices promoted
Care	Rd Bulawayo	zw	VIP construction in Binga, Gweru, Gokwe and Buhera		Deepwell construction Upgrading shallow wells borehole drilling Pump fitting VIP construction
ITDG	4 Ludlow Road, Newlands, Harare 788152/776107	itdg@samara.co.zw	Rain water Haversting under dry land conditions in Gwanda, Chimanimani	Mr. Kudzai Marovanidze	Water conservation contours Infiltration pits Underground water tanks Supporting drip kit irrigation for small holder nutrition gardens in communal areas.
PLAN International	3 and 7 Lizard Road Milton Park Harare (04)791601-6	Morane@plan.geis.com	Wells for Agriculture-Market gardening in Mutoko, Mutare, Chipinge, Chiredzi, Tstholotsho	Mr Collen Shoko	Promoting small drip irrigation kits Building and protection of wells Promotion of the Elephant pump
Nyakomba Development trust (N.D.T)	Nyakomba irrigation Scheme, Nyokamba, nyanga 091 928 769		Irrigation farming	Mr. Marambidza	Sprinkler system
World Vision International	59 Joseph Road, off Nursery Road Marlborough east (04) 778228/778158	zimbabwe@internet.co.zw		Mr Dhlamini	
Safire Southern Alliance for Indigenous Resources	10 Lawson Ave Milton Park Harare (04) 790470/ 796461/ 794333		Community water sector programme in Rushinga, Mwenezi, Chiredzi Market Linkages(USAID) for small holder farmers in agri-business Drip irrigation in Mzarabani and Rushinga Southern Africa Drought Network (SADN) in Mozambique, Zambia, Malawi	Mr. Zvidzai Chidhakwa	Drilling and maintaining boreholes Capacity building and promotion of CBM systems Promotion of conservation farming techniques (eg) zero tillage, mulching Drip kits In the SADN there is the identification of most promising technologies and their promotion Post harvest techniques

Name of NGO	Physical Address and tel numbers	Website	Project in irrigation for livelihood support : technologies and support	Contact person	Technologies /practices promoted
Zimbabwe Project Trust*	52 Fort Street, Bulawayo (09) 68804/71019	(09) 68804/71019	Sustainable rural livelihood program Energy support recovery in Insiza district of Matebeland South	Mrs Ndlovu	Drilling of boreholes Tradle pump systems
Zimbabwe-EU Microproject Programme (MPP)	6th Floor Hurudza House, CNr N Mandela Avenue and Park street, Harare	admin@hre.zimeumpp.co.zw	Small scale irrigation Conservation agriculture Agriculture recovery **(EU)**	Mr Dube (projects officer)	Gravity fed system and sprinkler systems Construction of dams Use of electric pumps Agriculture infrastructure building Capacity building
Catholic Development Commission	Lobengula street/9th ave Bulawayo 09-69218		Drip irrigation Borehole rehabilitation Building latrines	Mr. Tshuma	Drip kits as labor saving techniques Latrine construction Training of the village pump minders Drilling of boreholes
Jekesa Pfungwa	44 logan Hatfield Harare 04-570846		Sustainable agriculture in Chikwaka, Goromonzi, Mubaira, Mzarabani etc	Mrs Jambaya	Promotion of nutrition gardens, herb gardens Use of Drip kits
UNDP	67-69 Union Ave Takura Hse Harare 04-792681	Registry.zim@undp.org	Rehabilitation of irrigation schemes in Region 4 and 5	Mr. A Made	Promotion of Drip kits Distribution of tradle pumps
Zimbabwe Farmer's Union (ZFU)*	102 Fife Avenue/2nd Street, Harare (04) 251861-9	zfu@hqafricaonline.co.zw		Mrs. Mandishona 011 729 813	Promote irrigation through capacity building.

5. CONSIDERATIONS FOR SCALING UP

Agriculture is the cornerstone of the Zimbabwean economy and about 60% of the economically active population depends on it for food and employment. Women play an important role in agriculture and it is estimated that 70% of small-scale farmers are women. The Government of Zimbabwe is committed to ensuring food security by exploiting the harnessing of water for irrigation. There is evidence that the current policy on farming is to promote the small scale farmers through the land reform exercise.

5.1. Small Scale farmers: A1 and A2 farming schemes

A1 and A2 irrigation schemes: this is a new breed of irrigators in the country. The land reform undertaken by government has increased the area under smallholder irrigation. The reform has split up commercial irrigation schemes and ushered in two new groups of farmers, namely A1 who irrigate small areas at times with shared infrastructure and A2 who are the breed of commercial irrigators. In some cases, the A2 farmers also share irrigation infrastructure (69 714 ha). This development creates an opportunity for the scaling up of micro irrigation technologies that can be adapted to suite the different farmer needs.

5.2. Government support and the enabling environment

Since 1995, Zimbabwe has been involved in a complex water sector reform program aimed at decentralizing responsibility for water management from central government to new institutions made up of water users: catchment councils, sub-catchment councils and water user boards/associations. Objectives included: redressing past injustices in access water by the historically disadvantaged small-holder farmers and upcoming indigenous farmers without prejudicing large-scale commercial and estate concerns; to promote stakeholder participation and involvement in the decision-making process for the water sector; to promote an integrated approach to water resources development planning and management; and to remove inefficiencies in water use and make the sector self-sustaining. These reforms included putting more emphasis on cost recovery of investments in the water sector and treating water as an economic good.

5.2.1. Irrigation policy

Attempts are been made to formulate an irrigation policy for the country as evidenced by the writing of the Derude Policy paper on small-scale irrigation schemes (1983) and the FAO Irrigation policy and strategy document (1994). However none of these documents have been formally endorsed by government as policy on irrigation development. However various strategies have been put in place such as dam construction to harness water for irrigation. Recently irrigation development in small holder sub-sector has received substantial financial support from donors and NGOs.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1. Conclusions

6.1.1. General conclusions

The main conclusions observed during the study are:

i) The country' draft irrigation policy has not been finally endorsed and thus poor coordination among sector agencies

ii) The target of government irrigation schemes is more biased towards commercial rather than small scale micro irrigation

iii) Though there is promotion of small scale farmer irrigation through the land reform but there is no promotion of micro technologies for irrigation

iv) The country has a wealth of micro technologies for irrigation but these have been mainly promoted by NGOs that tended to focus on food security and the disadvantaged

v) The District Development Fund (DDF) which provides tillage services to irrigators and offers a nation wide public works facility for maintaining public infrastructure is only limited to boreholes and small dams.

vi) The Zimbabwean case is made more complex or interesting by the land reform program. This program has had a serious impact on both customary laws and the new water management regime in the sense that it generally does away with traditional forms of governance. At the same time, its 'fast track' nature seriously disturbed the smooth implementation of the water reform program in many ways and introduced a number of unforeseen problems for the water sector e.g. increased environmental degradation, uncontrolled water use in the resettlement areas, and difficulties in collecting water levies/tariffs.

vii) The land reform programme focused mainly on land distribution but did not emphasize on how to productively use the land which could have been done through the promotion and adoption of micro irrigation technologies

6.1.2. External support agencies and NGOs

i) Most support has been geared towards poverty alleviation and often only in response to a disaster situation so as to avoid a humanitarian crisis.

ii) The financial resources from the ESAs only reach the beneficiaries through middle agencies, namely the local NGOs. As a result the beneficiary communities have no control on the financial resources and even, in some cases, over the choice of technology they are to benefit from. Only between 30% and 50% of the original resources actually reach the communities.

iii) Co-ordination between government agencies and the NGOs on the ground is either minimal or plain hostile.

6.2. Recommendations

6.2.1. General recommendations

The study recommends that:

i) The dependency syndrome by the recipients donor support and the patronizing attitude of both government and NGOs, namely that they know what is good for the communities, need to be banished from the thinking of those involved in the micro irrigation initiatives.

ii) Zimbabwe finalizes the irrigation policy which should take care of the recent developments in the country

iii) There is need for coordination and information sharing through learning alliances on micro technologies being promoted by the different organizations so as to enhance adoption and up scaling

iv) For the successful adoption of micro irrigation technologies there is need of capacity building for a variety of stakeholders which includes government officials, recipient communities and service providers

v) Government and donors to focus on supporting developing private enterprises that support micro irrigation through the provision of local back up services.

6.2.2. External support agencies and NGOs

It is recommended that:

i) More support is directed towards institutional strengthening either through capacity building in existing government agencies or facilitating the creation of new community based organizations.

ii) The financial support to micro irrigation initiatives guarantees long-term sustainability by targeting the local initiatives and locally available technologies that have easy adaptability and readily available back-up services.

iii) There be more co-ordination among NGOs and between the NGOs and national government to limit the number of parallel initiatives. Such co-ordination is feasible if they derive their plans from national policies on irrigation development rather than from the policy thrust of the funding agencies.

iv) The ESAs and NGOs think beyond the “project” phase of their support but upscale activities to include initiatives that target the middle class through revolving financing mechanisms so as to enhance food security (as opposed to just alleviating poverty at the household level).

v) Support initiatives take cogniscence of not only the cost effectiveness of technologies but affordability and adoptability of the technology for a particular community or group.

ANNEXES

A. Contacts

Name of NGO	Physical Address and tel numbers	Website	Contact person
International Development Enterprise (IDE)	No 4 Stour Road, Vainona, Harare. (04) 851191/3	www.ide-international.org	Mkula Makasa
Zimbabwe Trust	3 Allan Wilson Ave Belgravia Harare (04) 792625/ 732254	info@art.org.zw	Mr. Nyakaza
Environment Africa	3 Durham Road Avondale West Harare (04) 339691/302886	eafrica@utande.co.zw	Mrs June
Goal Zimbabwe	22 Cleveland Avenue, Milton Park, Harare 798603/5	goal@mweb.co.zw	Mr Justin Mukeiwa
Zero international	158 Fife Avenue, Greenwood Park , Harare (04) 791333/732858/700030	zero@harare.iafrica.com/info@zero.org.zw	Mr. Chigwada
Care International	8 Ross Avenue Belgravia,Harare (04) 727986-8/708115/708047	carezim@icon.co.zw	Mr. Godfrey Mitti
Christian Care	121 Herbert Chitepo Rd Bulawayo	ccarenat@cst.co.zw	Mr. Chandomba
ITDG	4 Ludlow Road, Newlands, Harare 788152/776107	itdg@samara.co.zw	Mr. Kudzai Marovanidze
PLAN International	3 and 7 Lizard Road Milton Park Harare (04)791601-6	Morane@plan.geis.com	Mr Collen Shoko
Nyakomba Development trust (N.D.T)	Nyakomba irrigation Scheme, Nyokamba, nyanga 091 928 769		Mr. Marambidza
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Zimbabwe Farmer's Union (ZFU)*	102 Fife Avenue/2nd Street, Harare (04) 251861-9	zfu@hqafricaonline.co.zw	Mrs. Mandishona 011 729 813

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