

The Water Harvesting Innovations of Mr. Phiri Maseko

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Foreword by John Wilson, PELUM Association

There are many aspects to achieving sustainable land use and there are many individuals and organizations that are becoming involved in trying to work towards this. One very important aspect is the recognition of local initiators who have developed real examples of what it means to manage the land in a productive and sustainable way.

The work of these emulators, from all over the region, has two important roles.

- It provides practical examples that can be used elsewhere, being adapted where necessary
- It illustrates to the wider public the important part that local initiators play in developing new directions, a point that is quite often missed.

It is for these reasons that it has been decided to document in a small way the work of Mr. Zephania Phiri of Zvishavane.

Umqali Wesiziba

Mr. Zephania Phiri is an Umqali Wesiziba development initiator. Umqali Wesiziba has been set up to support grassroots development initiators and to spread information about their work.



The PELUM Association

The PELUM (Participatory Ecological Land Use Management) Association has been established in east and southern Africa to strengthen training in the field of PELUM amongst its members.



The Natural Farming Network (NFN) of Zimbabwe

NFN is an alliance of 12 Zimbabwean organizations and promotes ecologically, economically and usually sound agricultural practices in support of its members. Publishing useful books and booklets is an important part of this promotion.



Introduction

Extension work in developing countries has received a lot of criticism in the past. One of the arguments is that extension workers often use a top down approach that alienates local farmers and excludes their input. In the development process, local knowledge is very useful but can be ignored by project coordinators, donors and extensionists. It is wrong to see rural people as helpless individuals who need to be taught about their environment.

Mr. Zephania Phiri, a resourceful communal farmer from Zvishavane, is teaching extensionists and other farmers useful ways of managing the environment. Through his study of natural systems and years of experimentation and innovation, Mr. Phiri has transformed his landscape and achieved food security and self-sufficiency.

Mr. Phiri is outspoken on agricultural policy. He says that seed handouts are making people lazy and dependent and thinks that government should focus on construction of small seasonal dams in every community to ensure food security. He feels that the laws on wetlands are out of date and should be changed.

Although a number of setbacks were experienced during the recent droughts, Mr. Phiri feels that his water harvesting techniques put him at a clear advantage over other less fortunate people since his grass still grew and there is always water in his wells.

Pests have caused some damage to the crops but intercropping has played an important part in keeping pests at bay. Mr. Phiri is the only person in the area who has successfully been able to grow Mangos. He is not sure why but he thinks that it may be a result of the healthy water relations in his soil. He gives out seedlings to his neighbours but none of them seem to have been able to cultivate the tree.



Mr. Phiri focuses on three important areas:

- **Management of the water cycle** by sinking as much rainwater as possible, into the soil, in order to maintain the underground store and ensure enough surface storage for irrigation
- **Diversity in vegetation** by growing as many different species of annuals and perennials, exotics and indigenous species which help in pest control, maintenance of soil fertility, soil conservation and food security
- **Soil conservation** through construction of structures, maintenance of a diverse vegetation cover and control of livestock

History

Mr. Phiri became a farmer in the mid 60's after losing his Job with the railways because of his involvement with the union After this no one would employ him so he turned to farming as a way of supporting his family.

"Making optimal use of local resource's is one of Mr. Phiri favorite slogans and thus he decided to exploit the wetland on his plot for cultivation.

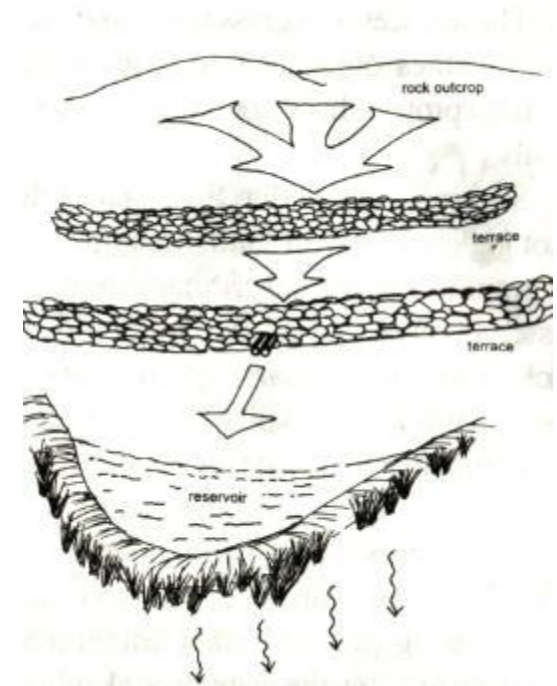
Streambank and wetland cultivation have been Illegal in Zimbabwe since colonial times. Mr. Phiri appeared in court three times on charges of violating the laws prohibiting wetland cultivation. On the third occasion Mr. Phiri invited the magistrate to see what he was actually doing on the land before making up his mind whether it was destructive or not The Magistrate agreed and was so convinced by Mr. Phiri achievements on the plot that he dropped the charges. Mr. Phiri has been given special permission to continue his cultivation practices.

After working with the Lutheran World Federation. Mr. Phiri was involved with the establishment of ZWRP, Zvishavane Water Resources Project, in 1987. The project arose out of consultation with farmers, initiated by a research team of which Mr. Phiri was apart. In 1988 he went to Britain to try to source funds and In Oxford he addressed the World Development Movement on Water Conservation

Learning about the land

Although Mr. Phiri only reached Standard 6, at school, he furthered his education by observation and study of the environment. He feels that there is something lacking in conventional education and acts why expansionists cannot demonstrate sustainable techniques to people saying that the best way to teach less through example.

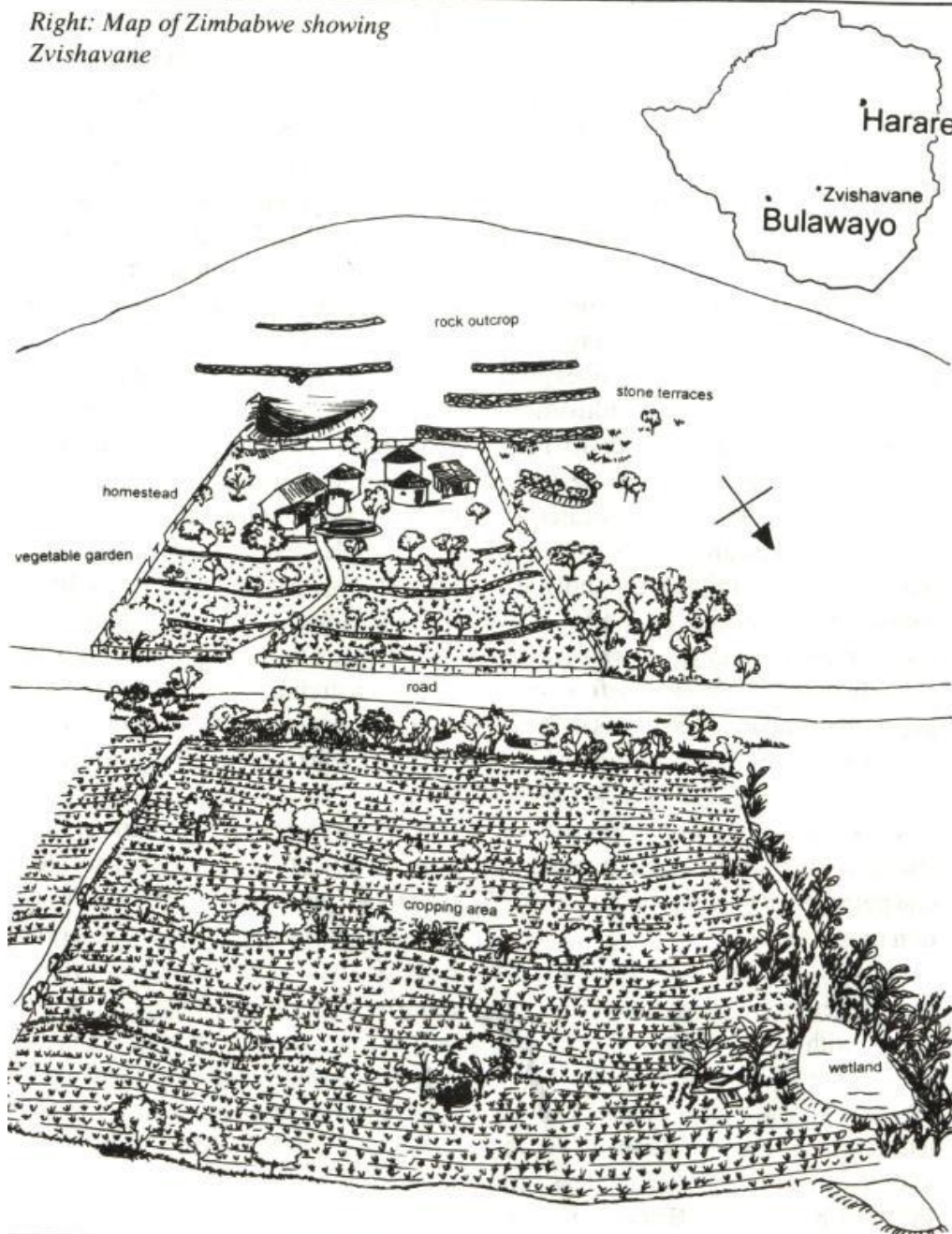
Early in his career he went to a farmers meeting in Mikhail where terracing, water harvesting, small day building, vegetable production and cattle husbandry were demonstrated. Mr. Phiri began to implement these ideas and set-up with his own innovations: infiltration pits, silt traps



and sacral terraces.

Not only a farmer and innovator, Mr. Phiri can divine water using a forked stick and uses the presence of certain trees as indicators of a high water table.

Right: Map of Zimbabwe showing
Zvishavane



Mr. Phiri understands natural systems. He says that soil erosion is a subtle process and most people don't notice when it starts. Denser crops should be grown to cover and hold the soil and improve infiltration. His approach is a holistic one. He sees the importance of helping the whole community and maintaining the natural vegetation.

The Land

The Phiri family live on a 3 hectare plot in Rude communal area, Zvishavane. This area is classified as Natural Region IV and has an annual average rainfall of 570mm. Mr. Phiri describes it as a dry area which is prone to droughts.

The plot is located on the slope of a hill which faces north north east. At the top of the hill is a bare rock outcrop; the homestead is situated immediately below this. The thin, gray soils at this point are predominantly sand. Progressing down the slope through the yard and across the road into the cropping area, the soils become deeper, darker and less stony; the clay content increases, especially towards the wetland in the north of the property. The wetland is an area which experiences seasonal water logging and is the source of a stream.

A tour around the plot *

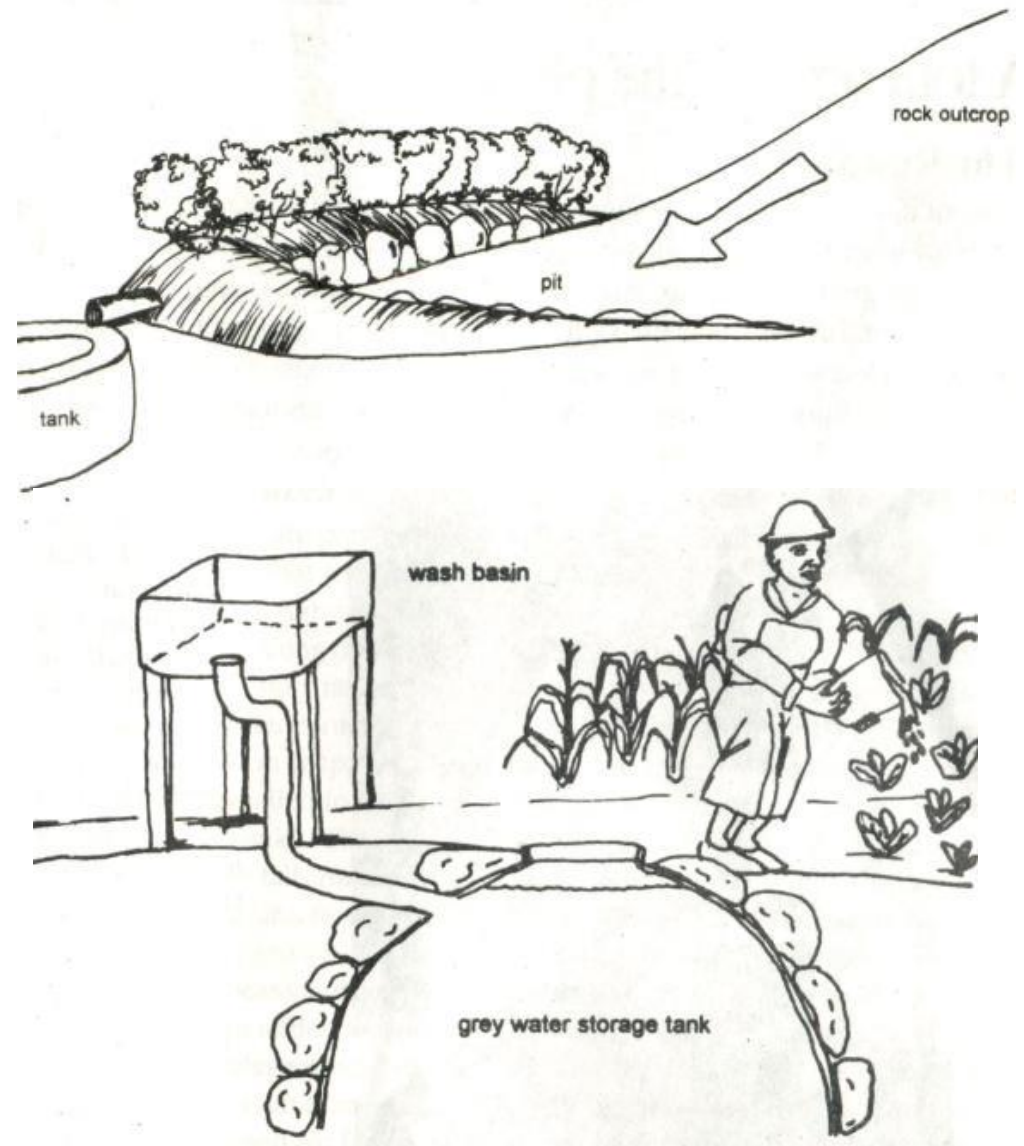
The Ruware

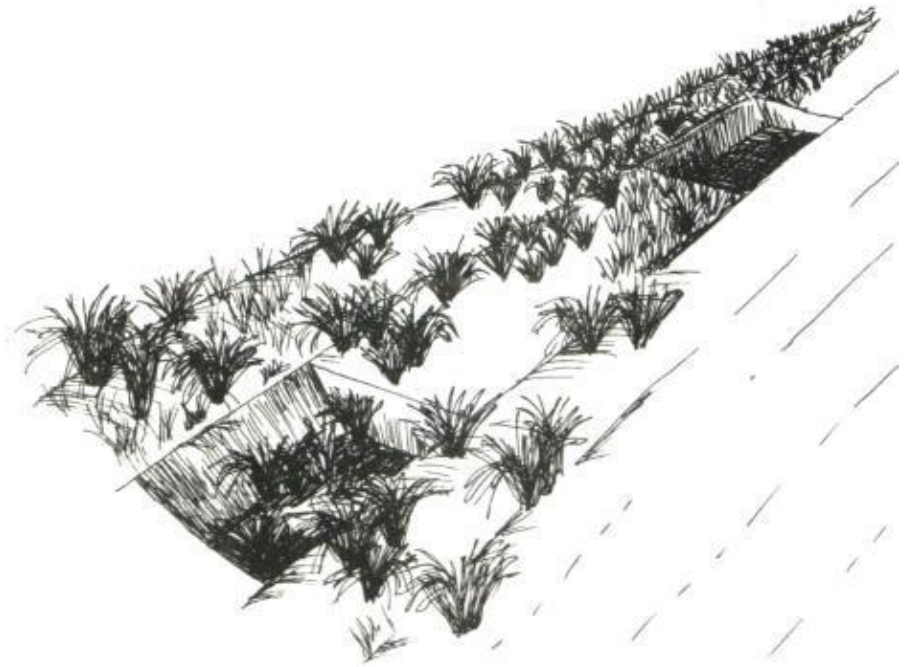
One of the most important resources (that many would see as a disadvantage) is the large granite dome or ruware above the plot. In an uncontrolled situation, this rock could cause severe erosion by channeling an intense volume of water onto the land down slope of it, where the Phiri family live and farm. Instead, however, the rock provides the main source of water for the trees, crops, and household. Tiers of stone wall terraces catch and direct the flow of water so that it can

sink into the soil and replenish the underground store The lower terraces are covered with soil and planted with a mixture of crops including groundnuts, pumpkins, chilies, indian beans and wild basal The leaves of the latter are made into an effective pesticide spray against aphids and other sucking insects that attack the fruit trees and vegetables

The terraces trap grass seeds and create swathes of protective vegetation. Fences protect this vegetation from animals. Silt traps ensure that the terraces do not get choked with sand Mr. Phiri has a graphic way of describing the process. He says that as the water flows across the land, a marriage takes place between it and the soil. This marriage is detrimental to the water cycle because it prevents efficient infiltration of water and causes soil erosion. So it is Mr. Phiri's task to divorce" the soil and water using pits and other catchments systems to allow the water to sink while trapping the rich alluvial soil which he then uses to fertilize his garden. The less fertile sand is scooped out and used for building the rich alluvial soil and organic material that has been trapped is made into compost

Most of the water is then channelled into a seasonal unsealed reservoir to encourage efficient infiltration of water into the soil rather than storing it on the surface. Some of the water from the "divorce pit" can be siphoned into a storage tank made from bricks and plaster Mr. Phiri knows that if a season is good enough to fill the reservoir three times then it will have sunk enough water underground to last for two years. Harvesting water at the top of the slope recharges the groundwater so that crops, trees and natural vegetation will have moisture available to them in the soil





Around the homestead

Below the ruware is the yard where the family lives. The terrain is quite steep and it is extensively terraced with strong stone structures. The family grows a wide variety of fruit and vegetables including, pigeon pea, pumpkins, beans, coco, rape, cabbage, tomatoes, onions, chilies, carrots, granadillas, mutohwe, Mexican apples, guards, oranges, harpies, peaches, paw paws, mangos, lemon and baobab sesbania, leuceana, tephrosia, moringa and many indigenous trees are also present Fuel wood is sourced from surrounding forests and harvested from the branches of trees on the property A Eucalyptus plantation was established in the past but when Mr. Phiri learnt that these trees have a bad effect on the water table he took most of them out. Chickens, ducks and turkeys are kept free range around the homestead The Phiri' have ten cattle and some goats which are

corralled near by. Fodder is grown for them in the garden and cropping area Fencing was necessary to keep them out of the crops and prevent



them from damaging the terraces Mr. Phiri sees fencing as an important step in the management of rural areas as animals can be a destructive force

Big pits have been dug around the homestead to catch "escaping" water There is a concrete tank for harvesting water off the corrugated iron roof of the main house Tins water can be used to irrigate the vegetable garden A lush granadilla creeper has been trained over the tank in order to keep the water and the house cool There are a number of orioles covered with various creepers to provide shade and a pleasant place to sit outside

Grey water from washing is piped into an underground store built with stones and lined with plastic. This water is used for irrigation

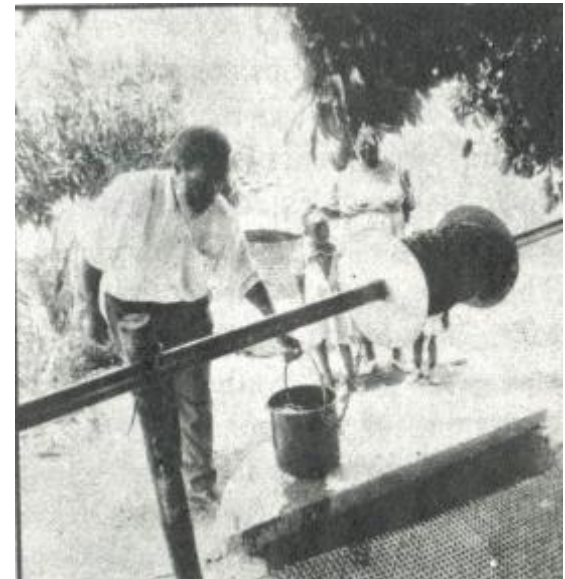
Between the homestead garden and the cropping area is a dust road Mr. Phiri has seen the need to control the run off from this surface and take advantage of it by channeling and sinking it into the soil above the fields He uses large pits dug into the soil at the side of the road Around these pits the indigenous vegetation has visibly benefited Thick shrubs and small trees are growing and the grass is dense

The cropping area

A variety of crops are grown In between contour ridges that were pegged by the Department of Agricultural and Technical Services Along these ridges Mr. Phiri has dug "infiltration pits" These are rectangular structures 4m long, 2m wide and 1m deep The front end of the pit is beveled to avoid undermining of the backs. The pits are covered with dense tall grass growth which stabilizes the structure

The main crops grown are maize intercropped with beans and pumpkins or sorghum, bulrush

millet, finger millet, sweet reeds, water melon, ground nuts, roundness, cassava and pigeon peas The latter is used for fodder and mulch. In wet years sweet potatoes are grown Open pollinated crop varieties are used so that Mr. Phiri can collect and keep seed from one year to the next According to the paper written with Michael Bussink, in 1988-89 Mr. Phiri was growing "23 different crop species and 26 different tree species plus reeds and grass fodder" Growing many crops is advantageous In a number of ways Firstly, It reduces the likelihood of pest attack Mr. Phiri does not use chemical pesticides Secondly, It provides food security because if some crops fall due to drought or disease, there will still be ones that





times of drought

will survive "Thirdly, the soil does not become exhausted of nutrients Manure and compost are used to fertilize the soil He discourages the use of chemical fertilizer because he says it destroys the soil structure

After sweet potatoes are grown the land is rested, so that it can recover its nutrients Grass and weeds from the contours and field are used for compost

In one field; Mr. Phiri is carrying out an experiment in crop spacing Here the maize is planted much more densely (30cm between rows) than is usually recommended The hope is that the loss in yield through competition will be balanced by retention of soil fertility though prevented erosion.

Mr. Phiri says that even if this fails he will have gained knowledge He says his crop yields have increased every year since he started his water conservation techniques He estimates that he gets 24 bags of cereals (including maize, sorghum and millet) per acre

Many trees are left in the cropping area along the contour strips. They give shade and shelter from wind and play an important role in soil conservation although some of the trees may compete with the crops they provide an important source of fruit. The shade provided gives a pleasant place for people to rest when they have been working hard. Three wells have been constructed in the cropping area. A network of irrigation pipes and canals help to supply crops with extra water during

Some vegetable gardens and a nursery are located close to two of the wells to take advantage of the extra water. The first well is the east of the plot is shallow and lined with stones It is fed by a channel slightly off contour, that harvests water off the land. The channel is lined with mango and banana trees. The aim of this well is to recharge the water table

The next well, uphill of the first, is the washing well. The water from this well is not fit to drink because it is not fully protected from contamination It is used for washing clothes and to irrigate the vegetables around it. Eggplants, banana, sugar cane and a few tobacco plants are grown around here Vetiver grass helps to stabilize the soil in this area

The well is about 13m deep An irrigation pipe that can be opened or closed, is sunk 18 inches into the soil at the mouth of the well. The well has no pump People from surrounding homesteads are permitted to come and collect water



The third well is close to the wetland. It is carefully protected and is used for drinking water the outlet flows along contour and can be channeled into the fields or into one of the ponds below Around this well are planted fault trees and vegetables including carrots, lab-lab beans, green bean, lettuce and tamarillo.

The thick grass that grows around the well makes good fodder for the dairy cattle There is a small nursery with sesbania, leuceana and fruit tree seedlings This well has a hand pump

The wetland



In the north of the site is a natural wetland system that Mr. Phiri has protected and harnessed for crop cultivation and water storage Two ponds have been dug The larger is the biggest up the slope and contains fish This over flows into a smaller pond downhill Reeds, sugarcane, bananas, kikuyu and elephant grass are planted densely on the banks of this area to hold the soil Mr. Phiri encourages all farmers he meets to grow reeds Not only are they good for soil conservation but they are a valuable cash crop as they are used in basket weaving Mr. Phiri gives free banana seedlings to the projects that he is involved with

The main pond has a rope and washer pump and a tyre pump Water from these seasonal ponds can be used for irrigation via the canals and pipes.

Streambank/ Wetland cultivation

Mr. Phiri denies that streambank cultivation is the main cause of soil erosion He thinks that other practices such as poor road construction,



bad ploughing and stumping of trees are far more serious Use of wetlands for cultivation was banned by the colonial government "in the name of environmental protection but in fact (it) was mainly to protect the economic position of the white farmers " (Phiri and Bussink 1992) Attention was only drawn to the fragility of wetlands after white farmers tried to plough it in first half of this century causing sheet wash and rilling (Whitlows 1983) This ignored the fact that stream bank and wetland cultivation had been a sustainable traditional practice amongst African farmers for centuries (Roberts and Lambert 1990)

Access to wetlands can give an opportunity for farmers to stabilize their production and so improve their food security (Phiri and Bussink 1992) Mr.

Phiri has shown that cultivating wetlands has “ made high productivity possible without damaging the main resource base, the land ” It is possible to get permission from the Natural Resources Board in order to carry out wetland or streambank cultivation but Mr. Phiri feels that this is not enough The legislation is out of date and can be seen to be a tool for the government to impose its own agenda In their paper Phiri and Bussink point out that it is time for an "Africanization" of the law to allow people to cultivate on wetlands This should be backed up with guidelines, extension and information programmes that will ensure sustainable use of wetlands

Extension Work

Mr. Phiri gets lots of visitor's people who want to see his ideas being demonstrated. At one time there was a party of 204 people. He is also invited by others to visit their regions to give them idea. Mr. Phiri feels that it is very important to spread his ideas. For example, he harvests water of the road into other peoples field as well as his own in order to maintain the water table. He also encourages neighbours to collect water from his wells if they need it. Of this lowest he says "it is not a selfish well" It is lined with stones so that the water can seep out to replenish the soil water store. Visits by Mr. Phiri to Chivi and Buhera have triggered the imitation of successful water harvesting projects in these areas.

The idea of ZWRP is to assist communities in tapping local resources. Initially the organization was mainly involved with applying for exemption orders for farmers who wished to practice streambank cultivation but later it became active in identifying other water projects and assisting communities in a number of areas such as construction of wells, small dams, roof tanks, ruware tanks (for harvesting water off rock and other surfaces), and erosion control structures

In his paper with Michael Bussink it is stated that "The success of projects is dependant on whether the community identifies their needs and problems themselves and become involved in their project's When asked how he manages to do so much Mr. Phiri replies "When one is committed one never feels tired".

This small booklet has been translated and reprinted with help from the Instituto de Permacultura Cerrado-Pantanal – a registered not-for-profit organisation working to advance Permaculture, in all its various forms within the central western part of Brasil – the biomes of Cerrado and Pantanal. The Institute works with indigenous communities, assentamentos and the urban poor of Campo Grande. They often offer courses at various levels, and can accept a limited number of people on a "learning experience" basis.

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