

## **CHAPTER 8**

### **CONCLUSIONS AND RECOMMENDATIONS**

The study has established that Dambos, as ecosystems, are strategic resources worthy exploiting for food production to cope with hunger which manifests particularly during drought years. Two reasons account for this: Firstly, they remain wet for a prolonged period into the dry season and their water tables are shallow enough to enable growing of vegetables. Secondly, they are inherently rich in organic matter and nutrients since they act as depositional sinks for run-off from surrounding high ground.

Dambos as wetland ecosystems exhibit different forms and types. Scattered throughout Zambia, over 3.6 million hectares of land, they occur as sweet, intermediate and sour Dambos. This classification is largely based on soil acidity. This study has established that the use of modifiers to classify Dambos is plausible and takes into account the genesis, origin, land use, physical and chemical characteristics, vegetational and hydrological aspects. These considerations accord with the professional inclination that ecologists, hydrologists, eco-tourists, agriculturalists and socio-economists have in defining Dambos.

The study has further concluded that Dambos are key resource areas that small-scale farmers have utilized for several decades on a sustainable basis. Given the frequent droughts that have characterized southern Africa and the associated dismal performance of rainfed crops, a mounting pressure on the use of Dambos has been evident throughout their places of occurrence because of their water storage and supplying potential which can support dry season cropping. In view of this, the study recommends options for wise land use on a sustainable basis.

The rain season affects different Dambos in different ways with frequent floods precluding cropping in some unless coping strategies are adopted by farmers whilst others assume optimal soil moisture conditions to allow for crop cultivation in them. These differences manifest depending on whether the Dambo is morphologically an upland, lowland or hanging Dambo. Rainfall distribution and intensity are major factors identified as recharging mechanisms. Vegetation changes in Dambo watershed influences recharge when evapotranspiration declines due to tree removal, the loss or shedding of leaves or replacement of trees by shallow rooted annual vegetable crops which transpire less than deep rooted trees in the Dambo watershed. Flooding intensity in Dambos during the rain season is linked to intense upland cultivation where soils are well drained. Extreme drought years are associated with receding water tables which force farmers to deepen wells to access the water.

Major limitations of lifting and transporting this water to areas where vegetables are grown within the Dambo suppress production because farmers traditionally use a small bucket tied to a rope to draw water and walk to a vegetable plot to irrigate limited pieces of land.

Due to the advent of the treadle pump technology, adapted according to farmer preference by this study and introduced in the pilot areas, net positive results are noticeable. The farmers have brand-named the treadle pump as the "**Chova pump**" which means to "**boost productivity and income**" and/or to "**pedal**" the device for it to operate. The manual foot operated pump has a copious discharge of between 1.5 l/s and 2.0 l/s which allows a farmer to irrigate larger areas than before and apply adequate amounts of water which give a long opportunity net-time as compared to deficit amounts applied using conventional buckets/watering cans wherein an everyday irrigation schedule is mandatory in order to cope with crop water requirements. The new technology is sustainable as it does not over pump and allows for any excess water to percolate into the soil and recycle back to the water table. In this way the Dambo is not at risk of drying up due to injudicious or unscrupulous means of water abstraction.

The pump has brought about some socio-economic, cultural and farming systems impacts on the community. Despite marketing problems which take place from time to time due to glut and poor infra-structural arrangements, farmers have been able to market their surplus produce resulting from increased yields due to the use of treadle pumps for irrigation. The study has documented cropping calendars developed by farmers to cope with flooding and marketing problems. They plant crops at certain times of the year to escape flooding or to coincide with existing local markets for the produce.

The introduction of the pump has attracted men to participate in irrigating vegetables - a role which was previously exclusively left to women and children who used buckets and watering cans. Due to this development, women are now able to do other chores whilst their husbands are operating the treadle pump to water the crops. Farmers are now able to irrigate larger areas (0.25 ha) per working day within 3-4 hours using the pump than the 0.10 ha in eight hours per day using watering cans and buckets.

The ease with which farmers are able to irrigate has resulted into extended dry season cropping and a change in their farming system. They now work throughout the year rather than have the now abandoned traditional ceremonies in the dry season as they would now be pre-occupied with irrigated vegetable cultivation. The associated positive impacts the pump has had in a short period of piloting has induced an adoption rate at an average of 800 pumps bought by farmers per year. To date there are about 2,500 pumps in use by farmers. This means that there are about 15,000 direct beneficiaries of the technology given that each farm family comprises six members.

Together with the treadle pump technology, the study has further introduced and disseminated to smallholder farmers, the clay pot sub-surface irrigation which saves on water by between 50% and 70% compared to the conventional irrigation systems. The system is very efficient in water utilization by crops. The technology is sustainable as it is home-made and involves rural women. This contributes to rural employment creation

among women who make the pots. The system is also appropriate for fruit trees which do well in the upper rassland zone where sandy soils are characteristic. With this irrigation system, labour savings are envisaged as there are long intervals between replenishing the water in the pots. Potential yields are also increased or maintained. Treadle pumps can be used to refill the pots by drawing water from the lower/central Dambo zones and reticulating it to higher lying areas of the Dambo where fruit trees easily adapt. The system supplies water to the crops as and when needed without undue over-irrigation and deep percolation.