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THE ELUSIVE MULTIPLE USES OF IRRIGATION WATER: SOME OF THE FORGOTTEN ISSUES IN SMALLHOLDER IRRIGATION SCHEMES DESIGNING IN ZIMBABWE

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ABSTRACT

Irrigation development is principally regarded as a technology to provide water for crop production. However, on most smallholder irrigation projects, often the irrigation water provides a wide range of other services besides just irrigating crops. These services, frequently unrecognized often contribute significantly to the local economy and quality of life of the irrigators. In addition to the single-use perspective in irrigation water, other irrigation infrastructure such as electrical energy for pumping is mostly limited to the pump station. These multiple uses of irrigation water and other important resources for the scheme such as electricity prove to be elusive to the policy makers, planners and project designers of smallholder irrigation schemes in Zimbabwe. This paper investigated why. We used a mixture of qualitative data collection techniques in this research. Our study demonstrated in several ways that smallholder irrigation should be conceptualised as a technological intervention to enhance the livelihood of a given community and not as a technology to just irrigate crops. Our conceptualisation of irrigation as part of a farming livelihood system opens up the irrigation infrastructure to other livelihood sustaining activities of the farmers. We, therefore, recommend a new a design culture for smallholder irrigation schemes. This new design culture must incorporate the multiple-use approach of irrigation water and other associated resources such as electricity for pumping at policy level.

Key words: smallholder irrigation, multiple-use, irrigation water, Zimbabwe

INTRODUCTION

In Zimbabwe, and in many developing countries, irrigation is primarily conceived as a technology to provide water for agricultural production only. The phrase, “crop per drop” has been used to express the value of irrigation water. However, in many smallholder irrigation projects, often the irrigation water provides a wide range of other unnoticed services besides irrigating crops. These unrecognised uses include other productive uses such as in vegetable gardens, livestock, fish and other aquatic products, and micro-enterprises such as brick-making and mineral processing. Also included are the reproductive domestic uses. Especially in arid and semi-arid areas, irrigation water may be the only source for domestic use for the households (Bakker, Barker, Meinzen-Dick, and Konradsen, 1999). Recently the environmental uses, including recharging groundwater, flushing contaminants, and supporting wildlife is another unrecognized beneficiary of irrigation water (Renwick, 2001). These activities, though, consume far less quantities of water relative to the total water abstracted for irrigated crop production. However, these unrecognized uses often contribute significantly to the local economy and quality of life in that they have high values in terms of household income, nutrition, and health in rural areas (Meinzen-Dick and Bakker, 2001). Lack of access to sufficient and reliable water for these productive and reproductive uses at an irrigation scheme exclude the people around from a range of options that would otherwise enable them to secure their sources of food and income (Upadhyay, 2004).

The single-use perspective in irrigation water is also replicated in electrical energy for pumping. On most smallholder irrigation schemes which have electricity driven pumps, electricity can only be found at the pump station. There is no provision for electricity to be used for other purposes like household requirements for the community in which the irrigation scheme is located, micro-industrial use (e.g. welding) which could even be used to mend broken irrigation pipes. If the farmers choose to diversify their cropping programs to include perishable horticultural crops, cold rooms will be needed. The electricity normally reserved for the pump station will be handy to power the cold rooms.

These multiple uses of irrigation water and other important resources for the scheme such as electricity prove to be elusive to the policy makers, planners and project designers of smallholder irrigation schemes in Zimbabwe. Why? A probable reason is the disaggregation of the water sector into a number of discrete sub-sectors, which barely ever work together or harmonize their actions. The agencies have an only sectoral responsibility which is either irrigation, domestic and industrial water supply or the environment (Bakker *et al.*, 1999).

How do the irrigators themselves and non-irrigators around the irrigation schemes respond to the single-use perspective of the scheme that is to irrigate crops only? Rather than face a system that only partially meets their requirements, the community always expand their opportunities by employing methods to extend the use of the irrigation water beyond just irrigating crops. We investigated these issues and the dangers imposed on the irrigators as they extend the use of irrigation water beyond just irrigating crops. This paper serves to bring to light some of these other uses of water in irrigation systems unrecognized by the policy makers, planners and project designers of smallholder irrigation schemes in Zimbabwe. The paper further highlights how irrigators grapple with the single-use perspective of irrigation water to derive multiple uses and consequently multiple outcomes or benefits which policy makers, planners and designers must recognize. It is our view that this single-use perspective of irrigation water arises due to a narrow conceptualisation of irrigation technology.

The empirical evidence was based on case studies of four selected smallholder irrigation schemes; of which three were located in the north-west part of Zimbabwe and one in the south-west. Yin (2003) defined the case study as "an empirical enquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident". We consciously wanted to cover the contextual conditions of how the smallholder irrigators and the community is coping with the existing irrigation infrastructure for it to meet the multiple uses of water and in the process benefit from the inherent many sources of evidence (Yin, 2003). The selection criteria for the irrigation schemes were arranged in a way that includes different water supply sources, irrigation systems, farming systems and different management structures. We used a mixture of qualitative data collection techniques. One of the techniques we relied a lot upon was participant observation in which we were able to see behavioural practices and patterns of the irrigators from our everyday interactions with them. We were also able to conduct several focus group discussions with the irrigators. An inventory of the resources on the ground was conducted to complement the other data collection approaches. This inventory was used for the identification and analysis of the resources available to the farmers and how these resources could be used. Basically the data collection exercise was aimed to answer questions which include: What water uses have been omitted from the present-day smallholder irrigation scheme designs? What are the smallholder irrigators and the community doing to these omissions? What strategies have they formulated to cope with the existing irrigation infrastructure for it to meet the multiple uses of water? What opportunities exist for the incorporation of the multiple uses of water into the already existing irrigation projects? The data collection exercise for this study was conducted during the period 2003 to 2006.

This paper proceeds by first giving the theoretical setting by discussing our proposed view of a wider conceptualization of irrigation development. A brief description of the study sites follows. The findings of the study are then discussed for each irrigation scheme in turn, focusing on the elusive multiple uses of water forgotten in the planning and designing stages and how the irrigators are coping with the single-use perspectives of the infrastructure. Finally, conclusions will be drawn on the implications of adopting a "natural resource system" and a "farming livelihood system" approach, which are wider conceptualizations of irrigation development.

CONCEPTUALIZING IRRIGATION

Irrigation can be conceptualised as a technology intervention to enhance crop production by artificially closing gaps from rainfall. Irrigation can also be conceptualised as a resource required for enhancing the livelihoods of a given society. In this conceptualisation, irrigation becomes a vehicle for rural development. This is a broader view which draws into the debate several "resource" perspective of irrigation development. These include the following:

a) Irrigation as part of a "Natural resource system": In this approach, water is regarded as a God given or natural resource from which none can exclude others. A vernacular Shona language, "*mvura hainyimwi munhu*" literally translated "*Water cannot be denied anyone*" sums up the all-inclusive use quality society attaches to water. This is all inclusive of other creatures like livestock, wild animals and aquatic life; clearly forcing the irrigation design to consider the multiple uses of water.

b) Irrigation as part of a "Farming livelihood system": This approach looks at an irrigation scheme as being a component of the farmers' farming system and their overall livelihood. This then opens up the irrigation infrastructure to other livelihood sustaining activities of the farmers. These other livelihood sustaining uses include water for domestic use (washing, drinking, bathing, etc) and electricity also for domestic and micro-industrial uses. Conceptualising irrigation in this way leads us into a new design culture that of a multiple-use approach of irrigation water and other associated resources such as electricity for pumping.

THE STUDY SITES

The following sites were selected for the study: Chifundi, Elmly Park and Musarurwa irrigation schemes all in north-west Zimbabwe and Zhulube irrigation scheme in the south-west part of the country. Chifundi and Elmly Park irrigation schemes are a product of Zimbabwe's hotly disputed fast-track resettlement/Agrarian Reform and are located in the former commercial farm lands whereas Musarurwa and Zhulube irrigation schemes are located in the rural/communal lands. Chifundi and Elmly Park irrigation schemes draw their water from boreholes; Musarurwa draws its water from the Manyame River, while Zhulube draws its water from the Zhulube dam. There are variations of technological designs and systems available at the schemes. Chifundi and Musarurwa use the semi-portable system; Elmly Park uses the centre pivot traveller system and Zhulube irrigation scheme uses the surface (basin) system.

RESULTS

Chifundi and Elmly Park Irrigation Schemes

Background

Chifundi and Elmly Park irrigation schemes evolved as a result of Zimbabwe's chaotic fast-track land resettlement programme. The schemes are located on two of three farms formerly owned by a commercial farmer, Mr. John Eden. The farms Chifundi and Elmly Park are located in Makonde District, Mashonaland West Province, which lies in the north-west part of Zimbabwe (see Figure 1 below). The farms fall within Natural Region (NR) IIa (Vincent & Thomas, 1960), which is an intensive farming area characterised by rainfall in the range 700-1000mm per annum. To get to the schemes, one travels 22km from Chinhoyi town along the Harare

Chirundu/Kariba road to Lions Den turning right into the Lions Den-Mhangura road for about 17km to the scheme.

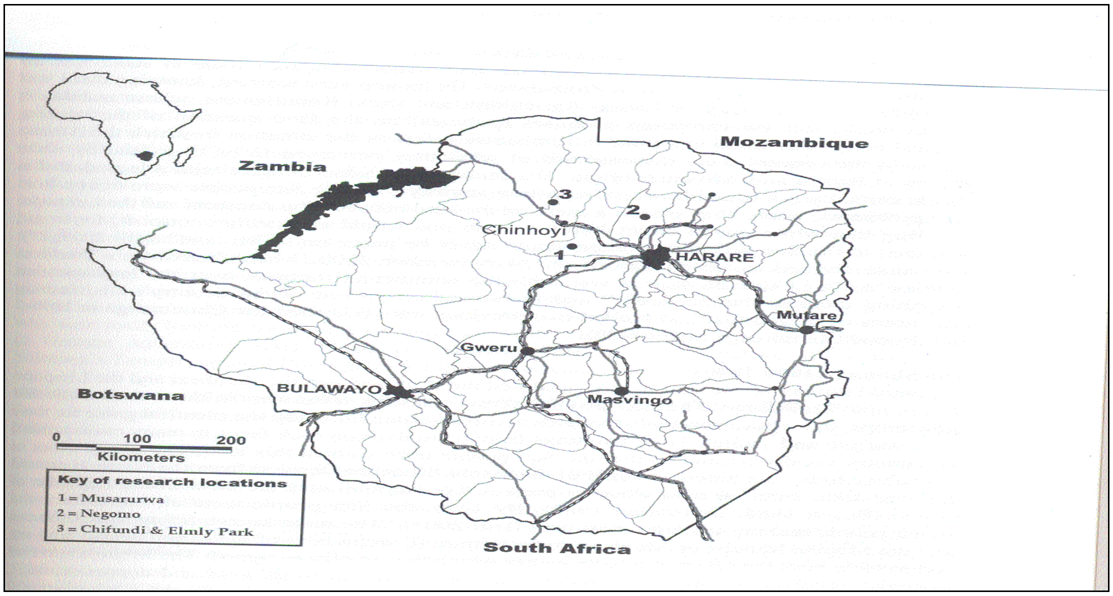

Figure 1: Location of Musarurwa Rural Area and Chifundi and Elmly Park Farms on the Map of Zimbabwe

Both Elmly Park and the adjoining Chifundi farms were the first in Makonde district to be occupied by "farm invaders" at the start of the Third Chimurenga, a vernacular language term describing an uprising in the year 2000. In the year 2001, the government of Zimbabwe formalized the acquisition of the farms and subdivided it for formal settlement as an A1 resettlement scheme under the Fast Track Resettlement Programme. The A1 model is a resettlement pattern based on the village system in which settlers are individually allocated 6 ha of arable land and about 12 ha of communal grazing land. The other resettlement pattern is the A2 model which is based on commercial farm settlement pattern and settlers are individually allocated land holdings ranging from 20 ha to about 1000 ha. In September 2001, a total of 31 and 44 families were resettled at Elmly Park and Chifundi farms, respectively.

Establishment of Chifundi and Elmly Park Irrigation Schemes

The schemes were established under the Winter Wheat Irrigation Rehabilitation Programme (WWIRP) in 2002. The programme targeted all settlers in the A1 and A2 resettlement farms to rehabilitate irrigation systems vandalised during the occupation process. The programme also assisted the settlers with other inputs like fertilizers, seed, tillage, harvesting and transport services, payment of irrigation energy bills and operational and maintenance costs. This government sponsored credit facility was accessed from the parastatal Agricultural

Development Authority, ARDA but through a complicated web of government agencies and other parastatals which the settlers had to endure (see Zawe 2006 for details on the credit facility web). This was a huge departure from the normal government way of doing business in which all spending was done through the Government Tender Board. So the process was subject to abuse. In the end, the majority of the beneficiaries were politicians and senior government officials in the army, police and civil service allocated A2 resettlement farms. As funds for WWIRP were mobilised, the 2002 Public Sector Investment Programme (PSIP) for irrigation development projects in the rural areas were suspended further slowing growth in this area. Traditional donors in smallholder irrigation development which includes the FAO, UNDP and EU Micro- Projects never participated in the WWIRP.

The resettled farmers held several talks with the former farm owner on a deal to utilise his irrigation equipment on the farm. Finally the irrigation equipment for the two farms was bought from the former farm owner. For Chifundi Irrigation Scheme, the equipment bought was a semi-portable sprinkler system capable of irrigating 110 hectares. The equipment was bought for close to fifteen million Zimbabwe Dollars (ZWD), equivalent to two hundred and sixty thousand US dollars. While for Elmly Park Irrigation Scheme, the irrigation equipment was bought for slightly over twenty-two million Zimbabwe Dollars, equivalent to three-hundred and eighty-six thousand US Dollars. The equipment bought included a centre pivot irrigating 80 hectares and a semi-portable irrigation equipment for 20 hectares. For both schemes, the payment also included the boreholes, pumps and motors. The former farm owner assisted the settlers putting both schemes back into operation, further advising them to incorporate selected former farm workers in the schemes to ensure the smooth operation of the irrigation systems. For Chifundi Irrigation Scheme, the former farm workers incorporated were the farm manager who now became the project manager, an electrician, three pump minders, and the security foreman. He emphasised that these people’s roles were of utmost importance in the smooth management of scheme. They had an average working experience of 22 years at this farm. The farmers accepted them into the scheme on condition that they were to continue performing their duties as before. Like the other farmers, they were allocated plots in the scheme. They would however be excused from other duties that the rest of the farmers would be expected to perform. In other words they were the same as the rest of the members and not special members in any way. The former farm workers agreed since they were now being allocated lands that they previously did not have. Elmly Park Irrigation Scheme on the other hand, did not take any former farm workers but instead sought the services of a white commercial farmer, Mr. Bosman who lived in a neighborhood farm. This commercial farmer operated the pivot in addition to providing other services such as tillage, spraying equipment and harvesting for a fee.

Water Source for the Schemes

Chifundi Irrigation Scheme was served by five boreholes of depth 50-60m and each with an average yield of 18 000 gallons per hour (90m^3/h). These boreholes have a capacity to irrigate a total of 140ha on the farm. The scheme operated with four of the five boreholes each fitted with a BH400 borehole pump which operated simultaneously pumping water into a reservoir from which a 125 Horse Power booster pump feeds into the sprinklers to irrigate 110 hectares.

The 80ha centre pivot for Elmly Park Irrigation Scheme was served by 5 boreholes each fitted with a BH400 borehole pump. These pumps operated simultaneously pumping water into a reservoir from which a 125 Horse Power booster pump fed the pivot.

The Schemes Organizational Evolution

At the start of the irrigation projects in 2002, both the farmers and AREX (Agricultural Research and Extension Services Department of the Ministry of Agriculture) were not sure of what organisational form the schemes would take. AREX was used to the idea of communal irrigation systems where each farmer at the scheme is allocated his plot and irrigation equipment. In addition, the pumping station is communal and all irrigate when the pump is running and each individual farmer does their own thing at their plot. However with the irrigation infrastructure in place at both Chifundi and Elmly Park, it was not easy to allocate each farmer his own plot and irrigation equipment, since this called for a redesigning of the irrigation systems, a process that would take long and would not make use of all the existing equipment acquired. For Elmly Park, the centre pivot can only irrigate a circle hence it was inconceivable to segment equal plots under a circle. So the systems had to be operated as single units with the farmers communally owning the irrigated blocks as well.

However, there were policy issues to worry about as well particularly concerning the size of irrigation holding per individual farmer. It was government policy that for communal area irrigation schemes, individual plot sizes ranges from 0.1 to 1.5 hectares. The average plot size for Chifundi and Elmly Park was 2.7 and 3.2 hectares respectively thus surpassing the 1.5 hectare limit.

At Elmly Park, the organisational framework revolved around the Irrigation Management Committee (IMC) formed to oversee the management of the scheme. The pivot was equipped with an automated irrigation management system (AIMS) panel. With this panel, the pivot can be started, stopped, reversed and speed changed by a single operator. An irrigation scheme manger post was created at the request of the commercial farmer who wanted to deal with a single person during his period of mentorship. At Chifundi, the Cooperative Association model evolved and the settlers worked as a group with communal ownership of the irrigated block. The organisational framework also included a production unit headed by the former commercial farmer’s farm manager to ensure the land remained productive.

The Schemes Cropping Programs

The farmers adopted the cropping program from the former farm owner, who practised the winter wheat followed by soyabeans rotation. To use his words, "soyabeans uses residual fertiliser from winter wheat, that is, you fertilise heavily your wheat and do not apply any fertiliser to your soyabeans". This rotation helps to reduce disease outbreaks as well. Mr. Eden advised the farmers to adhere to this cropping program if they wanted to succeed in their farming business. Both schemes, with advice from AREX agreed to the cropping programme and are recording very commendable yields. It must be noted that it was also AREX's "provincial policy" to promote wheat and soyabean crops and that production levels by former commercial farmers be maintained at these schemes.

Problems from the Single-Use Perspective of the Irrigation Water

Water for Household Use

The irrigation infrastructures at both schemes have no provision of water for household use because the scheme was designed to supply water to the irrigated blocks. During the irrigating periods, the farmers fetch water from the open night storage tank for domestic use. Children are normally assigned the task to collect domestic water. There is a risk of them falling into the tank and drown. Since the tank is open, a lot of dirt goes into the tank making the water unclean for domestic use posing a health risk to the users. However, the problem is further compounded during long breaks in irrigation such as when harvesting. The farmers will continue draw from the tank the water that was last pumped into it on the last irrigating day, until the tank is empty. The farmers will then be left with no water for household use. This water will be unsafe at all as the tank would have developed algae and since it is an open tank, one can imagine many kinds of dirty accumulating! However most of the farmers are forced to use this water as they have no other option. All this will pose a restriction to some water uses which may be undertaken if water for domestic purposes is available to the farmers. Some households will at this time use the unprotected shallow wells dug in the vlei part of the farm. These too are not safe for the farmers' health.

Water for Household Vegetable Gardens

The irrigation infrastructure at both Chifundi and Elmly Park farms have no provision for the farmers to irrigate small vegetable gardens for household consumption since it was designed to only irrigate the 110ha and 80ha blocks of land. To circumvent this problem, the farmers had to develop their own small nutrition gardens on the space available surrounding the night storage tanks. They irrigate their gardens using buckets, fetching water from the tank. Again children are normally assigned these tasks and the attendant danger of drowning remains. The watering of the nutrition gardens is mostly done during periods when the scheme's main blocks are being irrigated. However, during some periods when they are not irrigating these blocks, their gardens will suffer because there will be insufficient water in the tank for irrigation of these small gardens as well as for domestic use.

Household Electricity

Electricity power points are only limited to the pumping station and the farmers' homes are not served with electricity. With a little innovativeness, the irrigation technology package could have afforded the farmers electricity in their homes at a slight additional capital cost. This component too appears to have eluded the designers even during the rehabilitation/resuscitation of the irrigation schemes. Now the farmers are relying on fuel wood fire for heating and cooking purposes and the dangers of deforestation are lurking.

Musarurwa Irrigation Scheme

Background

Musarurwa Irrigation Scheme is situated in the Musarurwa village of Zvimba (see Figure 1 above), the home district of the State President, Mr. R. G. Mugabe. It lies some 50km south east of Chinhoyi town, the provincial capital and main service centre. The scheme can be reached via the Chinhoyi-Chegutu highway turning off at the 44km peg into the Robert Mugabe highway and proceeding along it for about 3km to get to the Murombedzi Business Centre. From Murombedzi Business Centre, the scheme is about 14km along the gravel road that leads to the Musarurwa village. The scheme can also be accessed from the national capital Harare. Compared to most smallholder irrigation schemes in Zimbabwe, the scheme is well positioned enjoying some of the best road networks.

The irrigation scheme lies in NR IIa, a region which generally receives sufficient rainfall for successful summer cropping without supplementary irrigation. The soils are mainly the granite-derived sandy loams of about 600-700 mm average depth. Inherent fertility is low but the soils can be productive with the correct use of fertiliser and manure.

Establishment of the Scheme

Musarurwa Irrigation Scheme was established in 1997 with a membership of 50 farmers, comprising of 33 female and 17 male plot holders. It has 25 hectares under irrigation. Each member was allocated a single plot of 0.5 hectares for growing food and commercial crops. The scheme uses a semi-portable sprinkler irrigation system. The irrigation division of the government agency, AREX planned and designed the scheme.

At the scheme level, two farmers are allocated infield equipment consisting of six sprinklers and fourteen aluminium pipes. The system was designed in such a way that all the 50 farmers operate their six sprinklers simultaneously when the pump is running. On the other hand, the system is not capable of providing the plot-holders with irrigation water on demand.

Water Source for the Scheme

Musarurwa Irrigation Scheme lies on the left bank of the perennial Manyame River. The water is pumped from a deep pool in this river by electricity powered pumps direct to the sprinklers via a conventional sprinkler pipe system.

The Schemes Organizational Evolution

The farmers were organised into a group headed by an elected Irrigation Management Committee. There are three other committees, the Disciplinary Committee, Water Committee, and the Marketing Committee to complete the management structure. One gets the impression that only this elaborate institutional arrangement made the Musarurwa Irrigation Scheme wheel turn. However, our stay at the irrigation scheme to observe the day-to-day operations revealed that there were other organisations and individuals involved who made the scheme function. For a detailed discussion of the operational realities at the scheme demonstrating how the crafted scheme institutional arrangements depended on other individuals and existing institutions see Zawe (2006).

The Scheme Cropping Program

In the scheme the farmers grow mainly green maize, groundnuts, sugar beans, potatoes and sweet potatoes. They also grow vegetables such as cabbages, tomatoes, onions, etc.

Problems from the Single-Use Perspective of the Irrigation Water

Water for Household Use

The scheme was designed in a way that, water will be pumped directly from the Manyame River deep pool to the sprinklers, via the conventional sprinkler pipe system. There is no other water available for drinking purposes whilst at the scheme and back in their homes for household use. Most of the farmers have now ended up using this row irrigation water to satisfy all their household requirements. This untreated water is not safe for the irrigators thereby subjecting themselves to water-borne diseases. A creative design could have used the same pumping and conveyance infrastructure to provide both raw irrigation water and treated household water at a slight additional capital cost. This innovative component appears to have eluded the planners and designers of this scheme.

On-Scheme Water Storage Facilities

As already alluded to earlier on, water is pumped directly to the sprinklers, and the scheme does not provide the farmers with water on demand. There is no storage tank or any other form of storing water to be used as and when farmers require it. For example, water was needed to gap-fill plants destroyed by pests or those that did not emerge so as to maintain required plant populations. Water is also required to spray chemicals and to irrigate some vegetable nurseries. All these other water uses do not necessarily require the pump to be started. However, to cope with the system's short-falls in this regard, the farmers were using drums and buckets as a means of storing water. Some even dug small ponds in the ground for this purpose. The design should have included water storage facilities at selected points in the scheme for these other water uses.

Household Electricity

Just like in the case of Chifundi and Elmly Park schemes described earlier on, electricity power points are only limited to the pumping station while the farmers' homes are not served with electricity. Again the irrigation technology package could have afforded the farmers electricity in their homes of course at a slight additional capital cost. This same electricity line could have been extended to the nearby Business Centre thus benefiting the entire Musarurwa community at large. This component too appears to have eluded the designers. The irrigators instead rely on fuel wood fire for heating and cooking purposes with the attendant dangers of deforestation lying in wait.

Zhulube Irrigation Scheme

Background

The Zhulube Irrigation Scheme is located in the Mzingwane catchment which is one of the seven catchments in Zimbabwe and it is lies in the semi-arid south-western part of Zimbabwe (see Fig. 2 below). The Mzingwane catchment itself is a sub-basin of the larger transboundary Limpopo basin in southern Africa, straddling the 4 countries: Botswana, Mozambique, South Africa and Zimbabwe. Zhulube Irrigation Scheme lies in the Zhulube catchment, a small part of the larger Mzingwane Catchment is located close to Filabusi (see Fig. 2), the main business centre of Insiza district. Accessing the scheme from the city of Bulawayo, one travels for 60km along the Bulawayo-Beitbridge highway, turning left into the Mbalabala-Filabusi highway for 40km to get to Filabusi Business Centre and finally for a further 15km of gravel road to get to the scheme.

After the siltation of 2 dams, the request by the Zhulube community for a dam has been under discussion for a long time. The dam was needed to provide water for livestock, domestic use and also for irrigation. The birth of the Zhulube Irrigation Scheme was an outcome of a community participatory/consultative process for the dam and irrigation projects under the facilitation of 3 institutional arrangements. These institutions were the old traditional structures, the new local government structures introduced after independence in 1980 and the donor World Vision. The traditional structure comprise of the villages headed by appointed kraal heads at the lowest level. An appointed Headman presides over several kraal heads and relatively few headmen are under an appointed Chief. There were over 20 kraal heads in the entire Zhulube catchment all under one Headman whose area of jurisdiction extended beyond the Zhulube catchment. The new administrative structure on the other hand consists of wards each comprised of 6 villages. The Village Assembly is the lowest arena where all members in the village meet. The Village Assembly is headed by a Village Development Committee (VIDCO) and it is not clear whether the members are appointed or elected. At the ward level there is a Ward Assembly where all members of the ward meet. The Ward Assembly is headed by a Ward Development Committee (WADCO) which the Councilor chairs. However, only the elected councilor is active while the other institutions appeared invisible. Other institutions and individuals with power of influence were also involved showing that institutions evolve through complex multiple processes one of which is that they are located in the daily interactions of the people (Cleaver, 2000; Svubure, 2007).

In the end, World Vision responded to the needs of the Zhulube community by designing and constructing the multipurpose 800 000 cubic meters Zhulube dam. The reservoir was constructed on the Zhulube River downstream of the 2 existing silted dams. The community provided labour through clearing the core trench area of the dam wall and also carried stones used for the dam wall.

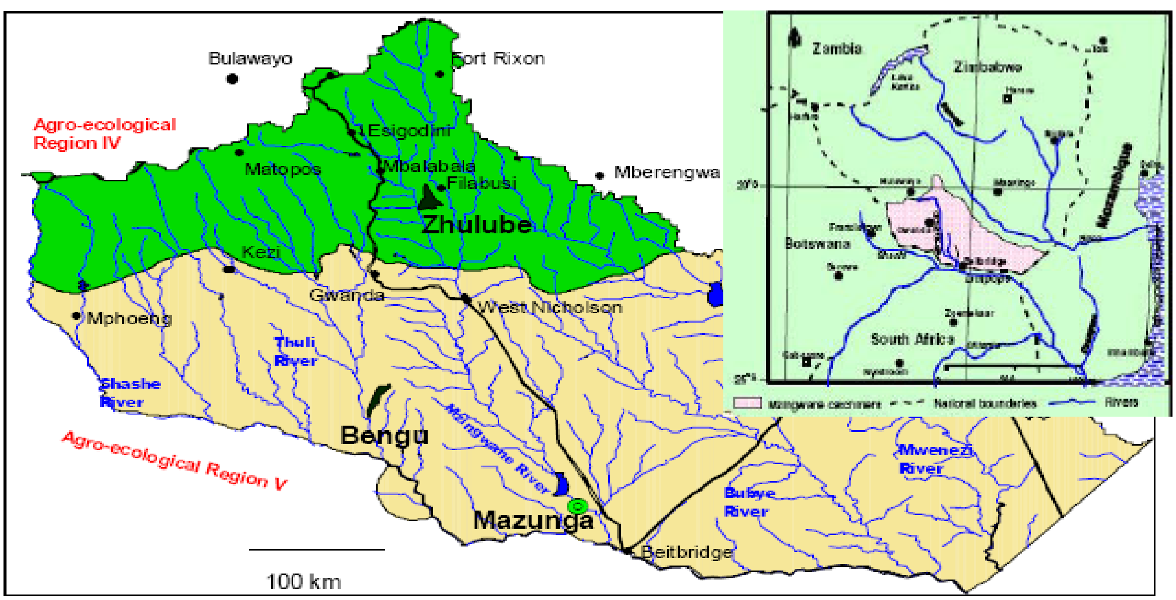

Figure 2: Location Map of the Zhulube Catchment, art of the larger Mzingwane Catchment in south-west Zimbabwe Source: Compiled from David Love, unpublished

Establishment of the Scheme

Land close to the Zhulube dam was identified for irrigation development. World Vision designed and constructed the irrigation scheme. Targeted for membership in the scheme were the bona fide residents of Ward 1. Consequently, all the 6 villages of Ward 1 were invited to come and work on the scheme construction. The work basically involved the trenching and clearing the land of bushes and trees. The 6 villages were Mpumelelo, Siyaphambili, Asibambaneni, Thuthuka, Thandanani, and Masiyephambili. To gain membership, one had to work for no pay. Obviously the scheme could not absorb all the families of Ward 1. World Vision was hoping for some self screening process to remain with the required number. The people's response was varied. Many people did not come to work on the irrigation construction for several reasons. The scheme was sited too far away from their residential homes. The scheme is located in Mpumelelo village. Siyaphambili, Asibambaneni, and Thandanani villages were particularly very far away from the irrigation site and most of them naturally opted out of the scheme. The distances involved were in the range of 10-15 kilometres range. The majority of the scheme members are from Mpumelelo village in which the scheme was located. Some opted out as they could not withstand the hard work associated with irrigated crop production. Others cited old age and could no longer afford the rigours of irrigated crop production. (For a detailed discussion of the selection process, see Svubure, 2007).

The irrigation scheme which has a net area of 15 hectares started operating in July 2003. The scheme has a membership of 41 plot-holders and is divided into 3 blocks of land. Each member was allocated about 0.1ha in each block making a total of about 0.3ha per irrigator. Water is conveyed from the dam to the field by gravity through a pipeline. The in-field works comprises of a network of (concrete) lined canals from which water is applied to the crops in basins through siphons.

The Scheme's Organizational Framework

At the inaugural training workshop organized by World Vision, the irrigators with the assistance of both World Vision and AREX crafted a number of management structures for the running of the scheme. It is at this same workshop that the running of the scheme was officially handed over to the irrigators, in line with the World Vision policy of project ownership by the beneficiaries. The irrigators, with the help of AREX and World Vision elected their Irrigation Management Committee, IMC also referred to as the Main Committee (MC) with Mr. Mpofu, a retired school headmaster as the first elected chairman of the scheme. Several sub-committees were created. The sub-committees include the Development, Water, Catchment Protection, Maintenance, Disciplinary, Buying and Marketing Committees. Each of these sub-committees is chaired by a member of the IMC. In addition, the IMC is empowered to create special sub-committees if there was need. Irrigation Management Committees (IMCs) have emerged as a way of giving more farmer participation in the management and maintenance of irrigation schemes in Zimbabwe, a policy government has adopted since independence in 1980

(Rukuni, 1984; FAO, 1999). Hence at each smallholder irrigation scheme, farmers IMCs have been established with the help of the government extension agency, AREX.

The Scheme's Cropping Program

In the scheme the farmers grows mainly green mealies, grain maize, groundnuts and sugar beans in summer. They also grow vegetables such as cabbages, tomatoes and onions in winter.

Problems from the Single-Use Perspective of the Irrigation Water

On-Scheme Drinking Water

The irrigators drink the canal water from the dam preferring this '*soft'* water to the '*hard'* borehole water when working in the scheme and in the process subjecting themselves to water-borne diseases. There is a borehole sunk in the scheme. Unlike in the other schemes already described, we notice here a deliberate attempt to satisfy this other water need of the irrigators, that is the provision of on-scheme drinking water through the borehole. However despite the provision of the borehole, we argue that an option to treat the irrigation water was better to provide the irrigators with not only safe water but '*soft'* water as well. The fact that the borehole water was not used render the borehole investment wasted.

Bathing and Laundry Facilities

There were no bathing and laundry facilities on the scheme. The irrigators used the canal water for laundry and we observed clothes hanging on the scheme's perimeter fencing. Optimizing use of time was clear from the focus group discussions with the irrigators. The irrigators had to spend the greater part of the day at the scheme given the fact that the scheme was located too far away from their homesteads. It was then necessary to do other household chores such as laundry and even to bath at the scheme after the day's work. Hence, the bathing and laundry facilities were needed in the scheme's design.

CONCLUSIONS

Evidence from our study has demonstrated in several ways that smallholder irrigation should be conceptualised as a technological intervention to enhance the livelihood of a given community. Our conceptualisation of irrigation as part of a *farming livelihood system* opens up the irrigation infrastructure to other livelihood sustaining activities of the farmers. Hence a new design culture for smallholder irrigation schemes, that of a multiple-use approach of irrigation water and other associated resources such as electricity for pumping merits consideration at policy level.

The interviews we conducted with the irrigators and our own observations of the day-to-day happenings at the irrigation schemes studied demonstrated the lack of consideration of the multiple uses of irrigation water and other inputs. Safe water for on-scheme drinking and use at home must be catered for in the scheme's designs. All the four irrigation schemes lacked safe water for drinking purposes exposing the irrigators to health risks by using the raw irrigation water.

Other water needs such as water for spraying, nurseries, livestock watering must be catered for in the designs. On-scheme storage facilities are needed for this purpose.

Electricity is a major driver of rural development, but in all the schemes with electricity-driven pumps studied, the electricity was limited only to the pump station. There is no provision for electricity to be used in the homes of the irrigators and also for other uses such as micro-industrial use in the community in which the irrigation scheme is located. Once the investment in electricity is done through irrigation, our study revealed that the entire community including the non-irrigators must take advantage of it. The community wants the provision of electricity to be extended beyond the pump house to cover their homes, the local business centres, nearby schools and clinics. The electricity will initiate other small scale enterprises such as welding and this will undoubtedly improve the overall quality of life in the entire community.

Lastly, there is scope for the incorporation of the multiple uses of water into the already existing irrigation projects. The irrigators themselves in grappling with the design omissions of multiple uses of irrigation water, responded by employing methods to extend the use of the irrigation water beyond just irrigating crops. For example, the farmers at one scheme frustrated by the absence of on-scheme water storage facilities dug pits and used drums to store water for crop spraying and watering nurseries. It is therefore possible to provide multiple uses of irrigation water and use of other irrigation infrastructure through close liaison with relevant sectors of government.

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