

Full Length Research Paper

Towards sustainable stakeholder engagement in smallholder irrigation schemes in Zimbabwe.

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Smallholder irrigation schemes in most developing countries including Zimbabwe have proved to be unsustainable after withdrawal of external assistance. The pre-independence community owned smallholder irrigation schemes had a fairly efficient management framework that, unfortunately, lacked the community ownership and professional execution. The post-independence smallholder irrigation schemes were heavily subsidized and failed to effectively empower the farmers to be managers of their own entities. This study was aimed at examining the stakeholder engagement and the sustainability of smallholder irrigation schemes. Understanding the problems faced in the engagement of these stakeholders will go a long way in enhancing the sustainability of the irrigation schemes. Three smallholder irrigation schemes from the Southern Eastern Low veld of Zimbabwe were purposively selected for the study. A total of 130 farmers were interviewed using questionnaires, 11 interviews of key informants and 3 focus group discussions with farmers in the 3 schemes were conducted. The study revealed that farmers had unsustainable sources of livelihood that were compromising their commitment to schemes. Due to very low levels of literacy, farmers were not participating in training programmes that were aimed at improving the production level. The farmers were struggling to pay the schemes' utility bills and the billing systems were perceived to be unfair. The Government departments involved in the schemes were under resourced and less skilled to leverage sustainable commercial production in the schemes. Private sector participation was very minimal. The stakeholder engagement in the schemes lacked owners and the development agencies were failing to involve the beneficiary farmers on strategic issues about their scheme.

Key words: Sustainability, smallholder irrigation schemes, stakeholder.

INTRODUCTION

Globally, irrigated agriculture plays a very important role in food security and livelihood improvements, especially in Asian farming systems and in most parts of Africa,

especially West Africa (Dittoh, 1991; World Bank, 2008). Irrigated agriculture is the most viable means of reducing food crop failure, hunger, and malnutrition in Africa, and

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an effective means for improving the competitiveness of smallholder farming in most parts of Africa (Meinzen-Dick et al., 1993). The pre- and post- independence histories of irrigation schemes of smallholder community in Zimbabwe exposes serious pitfalls in the engagement of relevant stakeholders involved in their establishment, rehabilitation and management, thereby compromising their sustainability.

The history of the development of smallholder community irrigation schemes in Zimbabwe can be traced back from the colonial era, where the Ministry of African Affairs helped in the schemes development. From 1912 to 1927, farmers enjoyed considerable autonomy in the development and management of their schemes, without much interference from central government (Alvord, 1933). Between 1927 and 1945, the Ministry started taking over the management and control of schemes, imposing compulsory crops like beans and wheat, under the name of technical assistance and famine relief (Rukuni, 1984; Manzungu, 1995; Meinzen-Dick, 1993). Smallholder irrigation farmers were made to surrender their dry land plots from 1936, and the government would identify, design and construct new schemes without consulting the intended beneficiaries- the indigenous population (Rukuni, 1988; Rukuni and Makadho, 1994). The regulations obliged farmers to solely depend on irrigation, discouraged them from involvement in rain-fed agriculture or off-farm activities and stipulated the types of commercial crops to be grown, following a prescribed cropping calendar and inputs (Manzungu, 1995). All the smallholder irrigation schemes were under the supervision of the then District Commissioner. With the land apportionment Act in 1948 and 1956, the Department of Native Agriculture took over the development and management of smallholder irrigations (Rukuni, 1988). The Control of Irrigable Areas Regulations of 1970 required farmers to sign annual renewable permits for residence, managing stock and cultivation- which were obligatory in terms of Section 9 (1) of G.N. 69/70). This clause allowed eviction of farmers not complying strictly with payment of fees and cultivation practices- reducing farmers to tenants in the schemes (Manzungu, 1995). There was widespread opposition by farmers to these requirements culminating in the closure of some schemes in the early 1970s (Roder, 1965; Manzungu, 1995). The post-independence smallholder irrigation schemes thrust was on poverty alleviation, to enhance food security, create employment, curb rural urban drift and modernize peasant farming (Manzungu and van der Zaag, 1996; Matsika, 1996; FAO, 1997; Chancellor, 2004; FAO, 2002; Makombe and Sampath, 2010). The schemes were all heavily subsidized by the Government. The Department of Rural Development (DERUDE) retained the development and management of irrigation schemes while the design and planning was transferred to the Department of Agricultural, Technical and Extension Services, (AGRITEX). Before transferring

development and management functions to AGRITEX in 1985, DERUDE introduced the concept of Irrigation Management Committees to promote democracy in the running of the schemes (Chidenga, 2003). AGRITEX retained the management responsibility of the schemes until 2001. For the smallholder irrigation farmers-out grower model under the management of the Agricultural and Rural Development Agency (ARDA), the Government designed operate and transfer schemes in which ARDA was expected to gradually transfer management and ownership to the smallholder irrigation farmers (FAO, 2001). Unfortunately, with sudden changes in economic and agricultural policies between 1980 and 1992, the ARDA's management transfer failed to be as gradual as was planned to the detriment of the farmers (Ruigu and Rukuni, 1990; Mombeshora, 2003).

A new Water Act replaced water rights and water permits in the 1990s- introducing Catchment Councils to manage water. This led to the creation of ZINWA (under the Ministry of Water Development) to manage water and the Catchment Councils (Chidenga, 2003; Makombe et al., 2004). In 2000, all new schemes were compelled to directly register themselves as clients of the Zimbabwe Electricity Supply Authority (ZESA) so that electricity bills could be billed directly to the plot holders (Chidenga, 2003). These new developments, in keeping with the Economic Structural Adjustment Programme (ESAP) and the user pay principles, led to the direct rise in production costs for the small holder farmers.

In 1999, 81% of area under irrigation was occupied by large scale commercial farms, 8.5 by government farms, 2% by out grower schemes while the smallholder schemes (including small-scale purchase areas) occupied 8.5% (AGRITEX, 1999). From the early 1980s up to the time of ESAP, 100% of capital costs and 89% of recurrent costs for community owned smallholder irrigation schemes were covered by the government (Scoones, 2013). These heavy subsidies provide little incentive for investments into privately owned smallholder irrigation farming by individual farmers. Therefore, individually owned small-scale irrigation farming, has not attracted the attention of as many researchers and development stakeholders as community owned smallholder irrigation schemes.

The agricultural sector suffered considerable neglect since early 2000, due the chaotic Fast Tract Land reform program, bad publicity and Zimbabwe's international isolation, resulting in lack of investment in the agricultural sector (including in research and development) and decreased productivity (Nhundu and Mushunje, 2010; Makadho, 2000). In addition, there was a lack of public-private partnership investment in the rural and agricultural commodity sector—a prerequisite and important catalyst for agricultural development and food production in developing countries (Chidenga, 2003). There was also a reduction in donor funding and foreign direct investment for agriculture since 2001. For example, between 1980

and 2002, multilateral institutions slashed official development assistance on agriculture, to Zimbabwe, from US\$3.4 billion to US\$500 million, an 85% decline (Poulton et al., 2002; Nhundu and Mushunje, 2010).

All these unfortunate developments culminated in Zimbabwe's worst economic crisis in its history, between 2000 and 2009, characterized by food shortages and record inflation. The annual inflation rate which averaged 12% in the 1980s skyrocketed to a record high of 11.3 million percent as of June 2008 (Nhundu and Mushunje, 2010). The economic melt-down during the 15 years preceding 2009 led to reduced capacity of the relevant Government departments, owing to high staff turn-over (which affected NGOs as well) and poor resources, to give sufficient support to the irrigation farmers (Mutambara and Hungwe, 2011).

The post hyper-inflation era in Zimbabwe attracted a lot of donor support with the focus of interventions shifting from relief programmes to longer term food security and livelihood recovery programs. This phase witnessed an increasing number of NGOs participating in the development, rehabilitation and management of smallholder irrigation schemes. Unfortunately, some community irrigation schemes that were rehabilitated after the hyper-inflation phase became non-functional or malfunctioned barely 3 years after rehabilitation. The Zimbabwe Rural Vulnerability Assessment for 2012 revealed that 24% of the wards in Zimbabwe had irrigation schemes and of the wards with irrigation schemes, 38% had functional schemes, whilst 30% had partially functional schemes. Thirty two percent of the wards had non-functional irrigation schemes amongst which were smallholder community irrigation schemes rehabilitated in the post inflation era (ZimVac, 2012). In the year 2013, only 40% of the irrigation schemes were fully functional (ZimVac, 2013). The biggest challenge faced by Zimbabwean smallholder irrigation schemes, as is the case with the whole of Africa, is to ensure that farmers are able to sustain their functionality status (Karugia, 2003; Svendsen et al., 2009; Webb, 1991). Considering the fact that the development and management of smallholder irrigation schemes involve a variety of stakeholders, the process of making them sustainable demands the use of holistic and more informed stakeholder engagement strategies (Koopman et al., 2001; FAO, 2000, 2001; Filcak et al., 2006).

The responsibility to manage and ensure functionality of communal irrigation schemes is split among several independent stakeholders with different interests and competencies, who require deliberate coordination effort to ensure smooth integration and cooperation. It is therefore critical that all the stakeholders are effectively engaged to ensure sustainability of the schemes (Commonwealth of Australia, 2000; Institute of Social and Ethical Accountability, 2005). No known research has explored how the different stakeholders involved in smallholder irrigation schemes in Zimbabwe have been

engaged and how the different engagement strategies have been affecting their sustainability. The main objective of the study is to investigate the factors that affect effective engagement of stakeholder in the smallholder irrigation schemes in Zimbabwe with a view to identifying loop holes in the engagement process that can be targeted for intervention and to recommend empirically based solutions to unlock the potential of these schemes.

MATERIALS AND METHODS

Three community-owned smallholder irrigation schemes were purposively selected for the study. Two of them (Tsvovani and Dendere) were operating below capacity while the other one (Mtandahwe) has been operating at full capacity in the 3 years preceding the survey. They were therefore, purposively chosen to be laboratories for the investigation of stakeholder engagement challenges facing community owned smallholder irrigation schemes (Tsovani and Dendere) and a locally designed solution for such challenges based on a successful example (Mtandahwe) close-by and within the same agro-climatic zone. All the 3 irrigation schemes had the same irrigation technology- flooding and had Save River as their source of water.

This research was an exploratory case study in which both quantitative (questionnaire survey) and qualitative (Focus group discussion and key informant interviews) research methods were employed. A semi structured household questionnaire was used to collect both quantitative and qualitative data from the irrigation plot holders in 3 small holder irrigation schemes. Data obtained from the questionnaire survey was augmented by Focus Group Discussions (FGDs), key informant interviews and direct observations targeting the 3 schemes. The combination of different research methods (questionnaire survey, FGDs and key informant interviews) allowed for triangulation of information. The simple random sampling method was used to select 40% of the farmers in the targeted schemes for questionnaire survey. The names of all the farmers were put in hat and 40% were randomly picked for the interviews. Tsovani (300 ha), Dendere (20 ha) and Mtandahwe (23 ha) irrigation schemes had a total membership of 120, 38 and 167 farmers respectively. Therefore, a total of 130 farmers were interviewed in the questionnaire survey. The farmer to irrigated surface ration for Tsvovani irrigation scheme was lower than the other two because Tsvovani was formerly designed to be institutionally managed by Agricultural and Rural development Authority (ARDA) in an arrangement in which each farmer, as an out-grower owned 3 ha. Dendere and Mtandahwe were designed to be community managed and each farmer owned an average of 0.1 ha, possibly to avert possible challenges in managing bigger hectares (Chidenga, 2003). Three FGDs were conducted in the three schemes (one FGD per scheme). FGD participants were selected from the farmers who had not participated in the questionnaire interviews. In order for one to qualify to be a participant in the FGDs, the farmer needed to have been working in the scheme consistently in the 3 years preceding the survey so that they could give meaningful contributions to the discussions. A total of 10 farmers participated in each FGDs, to give a total of 30 participants (50% of which were females). District Heads of institutions from Agricultural Research Technical and Extension Services (AGRITEX), Department of Irrigation (DOI), Zimbabwe Electricity Supply Authority (ZESA), Zimbabwe National Water Authority (ZINWA) and Rural District Council (RDC) from the two Districts (Chipinga and Chiredzi) were interviewed as key informants to the study. Eight key informant interviews were

conducted with these institutions to provide institutional perspective on the sustainability of the irrigation schemes. Three key informant interviews were also conducted with the Irrigation Management Committees (IMCs) of the three schemes to give a total of eleven key informant interviews conducted in this study. The data obtained from the questionnaire survey was inputted into SPSS version 16.0 (Statistical Package for Social Scientists). Data was subjected to both descriptive analysis (frequencies and percentages and averages) and advanced statistical analysis in the form of one way ANOVA and Chi-square.

RESULTS AND DISCUSSION

Demographic characteristics of the respondents

The majority of the respondents were between 30 and 69 years of age. Fifty-eight percent of the respondents were females while 42% were males. Seventy-two percent of the respondents were married, 21% were widowed while 6 and 3% were single and divorced, respectively. The average household size for all interviewed households was 7 against 5 at national level (ZimVac, 2012). The sex and age disaggregation of the farmers in the schemes confirmed the report of Muparange (2002) which showed that, in smallholder irrigation schemes, the most interested people were females and that the youth were generally not interested in agricultural production. This can impose potential threats to the future sustainability of these schemes since no institutional memory will be left after the current generation of farmers got out of picture.

Sixty-eight percent of the households had children less than 5 years of age with an average of 3 children under 5. Twenty percent had members who were chronically ill, 3% had terminally ill patients. Four percent had at least a member who was disabled or mentally ill and 37% had orphans. These findings are in line with national estimates which revealed that for all the rural households, 30% had orphans, 8% had a chronically ill or a mentally or physically challenged member (ZimVac, 2012). The vulnerability status of the households has a direct negative bearing on the viability of irrigation schemes in that, all the vulnerability categories need to be looked after by women who usually provide labour in the schemes. Parker et al. (2009) argued that shocks to households from diseases like HIV/AIDS can reverse developmental progress threatening economic sustainability of smallholder farming systems.

Educational level of the farmers

The level of illiteracy was on average higher than the national average, with an average of 37% (26% females and 11% males) of the farmers having not attained any level of education against a national average of 18.7%. This was especially true for Dendere and Tsvovani whose illiteracy level was 60 and 65% respectively, while at Mtandahwe, only 12% of farmers had not attained any

education at all as shown in Table 1. Less than 2% were educated beyond Ordinary Level against a national average of 3% (ZimVac, 2011).

The differences in the level of education of members in the three irrigation schemes were found to be significant by one way ANOVA at $P < 0.005$, in favour of Mtandahwe irrigation scheme which had the least number of farmers that had not attained any level of education. In Dendere, AGRITEX officers confirmed that due to the very low levels of literacy, farmers were not participating in training programmes that were aimed at improving the production level. The production of high value horticultural crops in irrigation schemes is usually knowledge intensive and the level of education of the farmer can be an important variable in the choice of crop and level of production. In Sub Saharan Africa, low level of education has been blamed for limiting access to information and understanding of commercial farming concepts which are critical to sustaining high production levels in irrigation schemes (Shah et al., 2002).

Irrigation farmers and casual labour

Farmers were also engaged in casual labour, locally termed "magau" which involves weeding, cutting cotton straws, picking cotton and watering gardens for other people in order to supplement their production. Fifty-eight percent of the farmers (45% females and 13% males) 26, 13 and 19% from Tsvovani, Mtandahwe and Dendere respectively, were engaged in casual labour.

The variety of livelihoods activities employed by the farmers in the three irrigation schemes may act as disincentive for serious commitment to the schemes by the farmers. Casual labouring activities (like stumping cotton stocks) had very low wage-rates and were frequently paid for in kind (usually maize and other staple foods). The FGDs revealed that these traded goods were then sold, often at poor or seasonally variable local rates, to generate cash needed for school fees or grinding mill fees. Involvement in casual labour was also blamed for keeping household members away from their own fields when they most needed attention, which could result in the depression of productivity in their own fields, threatening the sustainability of the schemes (Bodibe, 2006). This finding confirms the conclusion of Pocock (2012) that in Africa, casual work is not only poorly paid but leaches commitment to work at the scheme and affects productivity of the critical stakeholder- the farmers.

Irrigation Management Committees

All the schemes had male dominated Irrigation Management Committees (IMCs) (80% male and 20% female) by the time of the survey and all the respondents

Table 1. Highest level of education attained by farmers in the schemes.

Highest level of education attained	Scheme (%)			Total
	Mtandahwe	Dendere	Tsvovani	
None	12	60	65	37
primary	46	27	6	28
ZJC	24	13	10	18
O' level	16	0	17	14
A' level	2	0	2	2
Total	100	100	100	100

concluded on the idea that the role of the IMC was to manage all the aspects of the scheme. Differences were on the perception of the effectiveness of the IMC. All the respondents from Mtandahwe and Dendere felt their IMC was effective while 31% of the Tsvovani respondents felt their IMC was not very effective.

The differences in the perceived effectiveness of the IMCs of the 3 irrigation schemes were found to be significant by one way ANOVA at $P < 0.007$, in favour of Mtandahwe and Dendere irrigation schemes that had 100% of the farmers feeling that their IMC was effective. Those who felt their IMC was effective cited smooth flow of activities (82%), peaceful sharing of water (30%), and transparent and safe keeping of money (60%), compliance of farmers to their orders (70%), limited down times after irrigation pump breakdowns (20%). Those who felt the IMC was not effective cited lack of leadership qualities as the major indicator of their ineffectiveness (30%), lack of transparency on their handling of cash (25%), succumbing to intimidation (15%) and the existence of inter personal conflicts in the scheme (15%). It was noted in one of the FGDs that the IMC in Tsvovani needed to be more transparent on the way they used cash in the scheme. Some farmers no longer had confidence in the IMC as they strongly suspected some of the IMC members were pocketing their money. Consequently, some farmers were resisting payment of contribution towards the running of the scheme. Some blamed the IMC for lacking leadership skills and for being ineffective in containing conflicts. This negative attitude towards the effectiveness of the IMC in Tsvovani possibly explains why the members were failing to pay utility bills which according to the farmers were the major threat to the continued functionality of the scheme. Chidenga (2003) posited that if plot holders are well informed about the financial affairs of the IMC, they will have no choice but to be accountable to the members. This will have a significant positive impact on farmers' willingness to cooperate with the leadership they would have chosen. Transparency also creates an atmosphere in which fraud becomes difficult, increasing the likelihood that the farmers retain control and responsibility for their irrigation schemes, a critical element in sustainability (OECD,

1989; Muparange, 2002; Dzinavatonga, 2008).

The enforcement of the constitution in the schemes was found to be a strong pointer of the effectiveness of the IMC to engage the farmer. All the respondents indicated that they had a constitution in their respective schemes. Ninety-two percent felt their constitutions were being used and only 8% felt it was not being used. Evidence for the utilisation of the constitution includes the punishment of people whose behaviour was not in line with the provisions of the constitution and that all the farmers were contributing towards ZESA bills. Those who indicated that the constitution was not being used cited lack of compliance to the provisions of the constitution as evidence. In Tsvovani, some farmers indicated that if all the farmers had contributed towards the payment of electricity, the ZESA bill could not have reached \$40 000. Some farmers were not paying up. Although it was enshrined in their constitution that if someone fails to pay utility bills he/she can be expelled from the scheme, no serious action had been taken against the defaulters. Failure to expel non payers was tantamount to rewarding of bad behaviour and setting wrong precedence in the scheme. The IMC lacked power to operationalise the constitution. One participant in the FGDs said that the IMC were using all tactics to make farmers pay, like preventing one from watering, but when it comes to expelling one from the scheme, it was almost impossible for the IMC. During one of the FGDs in Tsvovani, one farmer said "*Simba racho unenge waripiwa nani rokudzinga munhu. Zvakango nyorwa muconstitution asi hazvitoiti*"-(Where would you get the power to expel someone from the scheme, it is not practical).

The effectiveness of the IMC in Mtandahwe and Dendere was shown by the fact that they had no problem in expelling non paying members from the scheme. In Dendere, the membership of the scheme shrank from 96 to the current level of 38 farmers, due to the non payment of critical contributions by some members. Consequently, Dendere actually had a positive balance of around \$500 in electricity bills and utility bills were the least of their worries. One striking thing about Dendere was that they had a reserved fund specifically for the repair of pumps which by the time of the survey was \$900, kept in the

scheme's bank account. They were all confident that after a pump breaks down, it would never have a downtime of over two days as the reserved money was used to pay for its repair. The farmers, having this culture of group saving, unfortunately were not making group efforts to procure critical inputs like fertilizers and certified seeds to boost their production. Some of the crops were pale due to lack of fertilizer but the very farmers were boasting of having reserved funds waiting for pump break down. Therefore, this level of functional dissonance in the saving pattern of the scheme was counter productive and rendered all their saving efforts unsustainable.

Mtandahwe had no outstanding arrears but had no reserved funds; neither did they have a bank account. The advantage of Mtandahwe was that they procured their inputs in groups which allowed them to have fair uniformity and timely operations in the scheme. They were also involved in group marketing of products to far away markets, especially during times of local market glut. The most striking feature about the IMC in Mtandahwe was the presence of a Marketing Sub-Committee overseeing the marketing dimension of their farming operations. This, according to Mtandahwe farmers who participated in the FGDs, explains why they had fewer problems in marketing their produce.

It was observed that environmental issues were better streamlined in Mtandahwe irrigation scheme than the other 2 schemes. Vegetative/live fence was planted along the perimeter fence of the scheme to ascertain the existence of the fence beyond the fencing poles and the barbed wire. Vetiver grass was also planted in the scheme, around areas highly susceptible to active erosion and gully formation to fortify the soil. Contrary, Dendere although well fenced with diamond mesh had no vegetative fence and the pump's suction point was not protected from the erosive forces of the river, threatening not only the pumps but the pump house as well. In Tsvovani the last piece of barbed wire around the perimeter fence of the scheme was last seen in 1996 before it was stolen. The scheme currently resembles an open communal crop field. Domestic animals pose serious security threats for the crops in the scheme. The fields are guarded day and night, giving more burdens to the already burdened farmers.

Tsvovani was paying 3 pump minders \$50 per month each to guard the pump while farmers in Dendere were taking turns to guard the pump at night. In Mtandahwe, the guards were allocated 0.1 ha of land to use as their pay for guarding the pump and the irrigation scheme. The Mtandahwe way of protecting pumps was a fairly sustainable way of payment because cash payment for a scheme that was struggling to pay monthly utility bills like Tsvovani means that one day the farmers may fail to pay the pump guards.

The different level of success of the IMCs was consistent with Chidenga (2003) findings that other schemes have disciplinary control while others were not

tight enough as their real power and duties has never been clear. Chidenga (2003) noted that the IMC never got the legal status and administrative authority exercised by the pre-independence irrigation managers and District Commissioners. Consequently, although the IMCs had the potential to effectively manage the scheme, they lacked power to operationalise their constitution and failed to transform the production levels, of the irrigation schemes to enhance their sustainability.

Zimbabwe National Water Authority (ZINWA)

Interviews with the farmers and the AGRITEX officers revealed that ZINWA played no role in the initial development of the scheme and only started to engage the farmer to make them pay water charges after the successful rehabilitation of the 3 schemes in 2009. Farmers in Tsvovani were aware that the ZINWA billing system was as follows; \$6.06 per hectare + 40% transmission losses + 25% value added tax. By the time of the survey, the scheme owed ZINWA US\$36 000.00 in water charges and had not paid anything to ZINWA since they started receiving the statements. It was not clear how ZINWA was going to react to the non payment although they were speculations that they were going to lock off their pumps to force them to pay, a development that will threaten the functionality of the schemes. Many stakeholders from the RDC, AGRITEX and Department of Irrigation have however questioned the sincerity of ZINWA in its dealing with farmers. When the pumps were under breakdown, ZINWA could not be seen anywhere closer to the farmers to give a hand in fixing them. It is only after the farmers would have won their war in the pump rehabilitation that ZINWA would chip in to bill water they did not help to extract. It was revealed in the discussion with stakeholders that when disconnecting farmers from water supply, ZINWA usually plans it when the crops in the schemes will be at a critical water demand stage as a way of forcing them to pay. This was in line with Mombeshora (2003) finding that ZESA and ZINWA usually disconnect electricity and water from farmers when the crops critically needed water. ZINWA's engagement with farmers lacked materiality (International Association of Public Participation, 2005) and farmers felt that ZINWA wanted to harvest where it did not sow. There is a need for ZINWA to come up with better packages and engagement strategies for farmers to deduce the ethical and economic logic of cooperating with it.

Department of Agricultural, Technical and Extension Services (AGRITEX)

Each irrigation scheme had at least one AGRITEX officer to provide extension services to the farmers. In Tsvovani,

there were 4 Agritex officers, one in each block. During the initial development of the scheme, Agritex was responsible for subdividing the plots and guiding the perimeter fencing of the schemes. In Tsvovani, the first Agritex officers were deployed in 2000; 3 years after the withdrawal of ARDA staff. Farmers in Tsvovani felt the Agritex officers were not as technically knowledgeable as ARDA extension officers. One farmer who participated in the FGD said *“Vatinavo ava vanongotaura, havapindi mumunda saka hatizonzwani. Vamwe vacho tinotovakundavo ruzivo”* (Unlike ARDA officers, the Agritex officers we have now just have theoretical knowledge and lack practical knowledge, we are even better than some of them). These shortcomings in the technical knowledge of the extension staff in the schemes was confirmed by the District Agritex officer, Chiredzi who indicated that some of them were trained through the Government’s Fast Track training programs and lacked practical skills. They were popularly called “the half backed extensionists”. The lack of technical capacity, according to the farmers in Tsvovani was compromising the production capacity of the schemes and restricting the type of crops the farmers could grow.

Conversely, Agritex officers in Dendere and Mtandahwe were highly valued and respected by the farmers. It was well expressed in the FGDs that farmers in the two schemes felt greatly indebted to the service of the Agritex officers that they allocated them a plot of land in their respective schemes. This, in turn was a strong motivational factor for the extension workers. Nevertheless, it was strongly felt in all the interviews with District AGRITEX officers that the extension support from the department was not adequate to leverage commercial production in the schemes. This confirms the finding of Denison and Musona (2007) in the South African smallholder irrigation extension support which they rated inadequate and unreliable to sustain commercial entities.

Department Of Irrigation (DOI)

The farmers felt the Department of Irrigation was almost invisible and were not aware of its roles and responsibilities. They took no part in the rehabilitation of Mtandahwe and Dendere. In Tsvovani, they were seen once when the water pumps were being installed in 2010. The district officers for the department felt the Irrigation Department was the least resourced Government department in the district. Their responsibility in smallholder irrigation scheme was mainly land survey, canal pegging and certification of work done by contractors. They had no vehicle and their visit to irrigation scheme was contingent upon the convergence of interests by some NGOs or other Government departments visiting the scheme in which case the officer would ask for transport assistance. They were largely office bound and did not have up to date information

about the smallholder schemes’ functionality status and requirement. The Department of Irrigation was largely an uninformed and disempowered stakeholder in the rehabilitation and management of smallholder irrigation schemes.

ARDA

Although ARDA was no longer managing any of the 3 irrigation schemes under investigation, its role in Tsvovani was worth explored. The Farmers in Tsvovani indicated that when ARDA was still managing the schemes, it was doing everything for them on the scheme ranging from the provision of inputs, tillage, planting, weed management, nutritional management, harvesting and marketing. The farmers were at times asked to weed and provide manual labour in their plot and would just be treated like farm workers. For harvesting of maize and wheat, the farmers narrated that ARDA had combine harvesters which were rotating all ARDA estates during harvesting time to harvest maize or wheat. Fertilizer and seeds would come in 30 ton trucks for the farmers and all the cost were deducted from the farmers’ cheques after every cropping cycle. ARDA would also arrange loans from AgriBank for the farmers. ARDA owned the engagement process for stakeholders in the input and output supply market, the financial resources and general farm management. Farmers were very happy with the arrangement and would have wanted the arrangement to last for ever as they were now failing to manage the scheme on their own- pushing them into grinding poverty. One farmer said *“...that is the arrangement that bought us the tractors we have but now I am failing to buy diesel for the very tractor to till my land”*. The arrangement was good for them but its exit strategy was not well managed as ARDA suddenly withdrew from the scheme without proper handover and takeover of the management of the scheme. Its major weakness was its failure to involve the farmers themselves in the process to preserve institutional memory and for the sustainability of the scheme beyond the management of ARDA. The ARDA management left a dependency syndrome in the farmer, that was not seen in Dendere and Mtandahwe, which is threatening the functionality of the Tsvovani scheme as farmers still expected outside assistance in the payment of utility bills and procurement of inputs. What was probably lacking in the engagement process of ARDA’s operate and transfer method was an empowerment element as it was devoid of plans about farmer’s future after ARDA’s departure. The arrangement was also a victim of unfortunate economic dynamics in the national economy, particularly the aftermath of ESAP.

Zimbabwe Electricity Supply Authority (ZESA)

ZESA confirmed, during key informant interviews, that it

Table 2. Perception on continued functionality without external support.

Name of scheme	Perception on functionality without any external support, in the next 5 years		Total
	Yes	No	Yes
Mtandahwe	46	21	67
Dendere	7	8	15
Tsvovani	15	33	48
Total	68	62	130

was charging commercial rates on the smallholder irrigation schemes and farmers felt ZESA was not fair in its billing system. In Mtandahwe, farmers were collectively paying around \$900 per month for electricity and although the farmers were fully paid up, farmers complained that there were no variations in the electricity charges to reflect the different electricity utilisation pattern of the different cropping cycles and watering intervals in the scheme. This was believed to be caused by the use of estimates to bill farmers as ZESA officials rarely visited the scheme to take actual readings. Even if they later discovered that they had overcharged farmers, the rectification of the problem was never done and explanations to it were not convincing to the farmers. Dendere farmers had similar experience with the farmers having about \$500 positive balance due to previous overcharge by ZESA which took a long time to rectify. In both schemes farmers reported that ZESA would be very quick to disconnect the supply without verifying the accuracy of their bills.

Tsvovani's future was dangling in the air due to the ever ballooning electricity bill. Like in the other 2 schemes, charges were accumulating during the decade of disrepair. When the scheme was successfully rehabilitated, the farmers had over \$10000 outstanding electricity bill. When they commenced production, the farmers were consuming electricity worth around \$6000 per month but were only able to pay \$1200 per month which was only 20% of their monthly consumption. Consequently, the charges accumulated to around \$40000 (from the main pumping unit, 3 sub pumping units at reservoirs and 2 disused borehole pumping units) by the time of the survey for this study. The scheme was once disconnected only to be connected after the intervention of the political leadership after which a contract was reached to extend the grace period for the payment to 6 months.

Approaching the deadline in October 2012, farmers were nowhere closer to half payment of the bill and expect another extension by 6 months. In order to convince ZESA, the farmers had agreed to pay \$100 each per month for the month of August and September which could raise them \$24000 if every member paid up. Asked why they have not been making such big payments, farmers indicated that they expected to raise

enough money to pay the ZESA bill from the sale of cotton but when the cotton price dropped by over 260%, during the 2011-2012 season, farmers resorted to the alternative debt settlement plan. ZESA indicated that disconnecting farmers from the electricity grid was the last option if they prove to be uncooperative and uncommitted to the settlement of their bill. Farmers indicated that they would not be able to pay the electricity bills without external assistance, making it a major threat to the future functionality and sustainability of the scheme as shown in Table 2.

The difference on the sustainability perception of the scheme beyond external assistance in the different schemes was found to be statistically significant at $P < 0.000$ using one way ANOVA. A Chi square analysis also proved the differences in perceived functionality of the schemes without external support to be significant at $P < 0.05$. Farmers in Mtandahwe strongly thought their scheme would continue to function beyond external assistance while those in Tsvovani strong felt their scheme will not remain functional. The explanation given by Tsvovani farmers for this perception revolved around the arrears in electricity and water bills amounting to over \$60 000 in Tsvovani and farmers felt would not be able pay off and remain functional.

Non Governmental Organisations (NGOs)

It was revealed that NGOs were major players in the establishment of small-scale irrigation schemes and in their rehabilitation. They provided funds for the scheme establishment and in the rehabilitation of the schemes. Mtandahwe and Dendere were established through NGOs, World Vision and Red Barna respectively. After the pegging by Agritex, the NGO would oversee the engagement of the community, consultants, contractors/ service provider and all the relevant Government stakeholders. The meetings, workshops and trainings linked to the establishment and rehabilitation of the schemes were all financed by the NGO. The NGO was also responsible for hiring an engineer who did pump installation at the schemes, procuring the pump and paying for the perimeter fencing of the scheme. For Dendere, the Agritex officers who participated in the

perimeter fencing of the scheme were paid travel and subsistence allowances by Red Barna. After successfully establishing the scheme, the Red Barna grew crops for two years providing farmers with all the inputs at zero cost. One farmer said *“we were just taking fertilizers and other input from this warehouse for 2 years”*. After harvest, the farmers would pocket the proceeds. The scheme was handed over to the community in 1997 and Red Barna left.

In Mtandahwe, the NGO that rehabilitated the scheme also constructed a grading shade, a 3 roomed office, a plinth and a summer season pump house to prevent the pump from damage by floods. It also procured all the fencing materials for the 23 ha scheme. The fencing was done by the community under the supervision of Agritex and Mercy Corps. The chairman of the scheme had records on the costs of the rehabilitation cost and the cost of material and labour contributed by the community. The organisation also gave seeds and fertilizer to farmers for the first two cropping cycle after rehabilitation as a way of supporting farmers' post rehabilitation production. All the ZESA bills and installation costs were covered by the organisation and farmers started on a clean sheet. This helped to unleash the potential of the farmers as production cost at the initial stages were reduced to a minimum and would face actual cost when they have fully recovered. The variety of activities or intervention implemented by Mercy Corps in the rehabilitation of Mtandahwe irrigation scheme confirms (VanSant, 2003) argument that the sustainability of NGO efforts in rural development depend on the program quality and diversification.

This was in sharp contrast to the experiences of Tsvovani and Dendere after rehabilitation in 2010 where they were not assisted with input by the NGO that helped them to rehabilitate the scheme. In Tsvovani it was just the replacement of the pumps, no perimeter fencing and canal rehabilitation was done. Farmers struggled to finance their first cropping cycle without fertilizers and sufficient seeds. The poor yields that ensued set the tone that perpetuated up to date and farmers were never given a chance to unleash their potential. Their ZESA bill that had accumulated over the period of breakdown welcomed the farmers after rehabilitation. They described the bill as the ghost that is haunting the scheme, threatening the sustainability of the scheme. This explains why the Commonwealth of Australia (2003) cautioned that, if donors wish to see benefits sustained, they should, on a case-by-case basis, also consider taking on responsibility for contributing to solving operation and maintenance cost problems in a more direct way. The approach used by the NGOs who rehabilitated the Tsvovani and Dendere schemes lacked materiality and responsiveness as they failed to address the crucial and most important concerns of the farmers they were trying to assist (AccountAbility, 2005).

The unfortunate thing about the NGOs that rehabilitated

the 2 schemes (Tsvovani and Dendere) was that they were not disclosing to the farmers information about the cost incurred to establish the scheme. As a result, farmers were not aware of the value of the assets handed over to them by development agencies. The engineers who installed the pumps and the suppliers of the pumps had contracts with the donor and not with the farmer, imposing legal complications when the community attempted to get some restitutions or backup services or follow up on contractual obligations. The farmers did not know where to get new pumps for replacement or where to get spare parts for repairs. Knowledge about suppliers of equipments and item prices is ideally a sustainability measure as people will appreciate the value of assets entrusted to them by outsiders and the amount of care they should give to safeguard them, who will fix it in case of break down and at what cost. Effective engagement depends upon a shared understanding of issues which works best when all participants have access to the same information (AccountAbility, 2005; Crosby, 2000; Perry 1997). This explains why Chandrasekera (2004) opined that lack of information can be a critical sustainability threat. Ideally, stakeholder engagement in the development of smallholder irrigation schemes promotes community ownership of issues and inculcates a sense of responsibility and accountability for both private, Governmental and Non Governmental stakeholders (Commonwealth of Australia, 2000).

Business community participation

The private sector today is increasingly called upon to take significant responsibility for resolving some of the world's most intractable problems like the sustainability challenges of smallholder irrigation schemes (World Bank, 2008; Stakeholder dialogue, 2012; Dittoh et al., 2010). Unfortunately for the establishment and rehabilitation of the three schemes under investigation, the business community involvement was very limited. Contractors and middlemen who were supplying parts and pumps during the rehabilitation of the irrigation schemes were the major private sector players. The only spectacular private sector engagement was noted in Mtandahwe where Triangle and Hippo valley sugar companies were engaged to provide tillage services as part of their corporate social responsibility. The NGO that assisted in the rehabilitation of Mtandahwe (Mercy Corps) partnered with Hippo valley and Triangle under an arrangement where the two organisations provided the first tillage service after rehabilitation and did land scarping and levelling to allow efficient flow of the flood irrigation water in the beds. This was done at no cost to both Mercy Corps and the farmers. The farmers who participated in the FGDs acknowledged that the service provided by the two sugar giant companies made the irrigation more efficient than it was before the rehabilitation

as it ensured that all the part of the scheme accessed water. Farmers in Mtandahwe indicated that there was no way farmers could have approached these two sugar giant companies without the help of Mercy Corps and that this partnership, hitherto, embolden them to confidently interact with the private sector in search of markets and other agricultural synergetic linkages. The Mtandahwe experience confirmed Fowler's (1997) revelation that NGOs skate on a thin ice and what is required to implement effective and sustainable programs under such circumstances are interactive-authentic partnerships for greater impact and reducing dependence on donor funding. Farmers in Tsvovani were linked to National foods as the buyer of their wheat in the late 1980s and Windmill as their supplier of fertilizers on credit payable after harvest. After being weaned from ARDA they never had any meaningful private sector partnership. It was also unfortunate to note that all the 3 schemes were not under any form of contract farming with the private organisations by the time of the survey.

Rural District Councils (RDC)

One missing link in the irrigation scheme management was the RDC. It was revealed in the FGDs with farmers and stakeholders that the major problem with small holder irrigation scheme was lack of owners in the engagement process. Several stakeholders were involved from initial development, rehabilitation and cropping management and marketing. But the question was who will bring these stakeholders together? It was not Agritex because Agritex ended at provision of extension services neither was it the responsibility of the Department of Irrigation, whose scope was restricted to designing of irrigation schemes, pump installation or repair and canal construction. Farmers, ideally, through their leadership (IMC) should be owners of the engagement process, but they had limited powers to stand on an equal footing with other stakeholders like ZESA, NGOs, Government departments and other private companies. The engagement of the stakeholder lacked inclusivity as there was no one to hold them accountable to strategically respond to sustainability concerns of the schemes. There was no one to establish the boundaries of disclosure of the engagement specifying what information should be shared with other stakeholders. Ideally, the RDC as the local Government at district level thought to be the owner of the engagement process for the management of the smallholder irrigation schemes. Unfortunately, the RDC was neither an actor nor a factor in the management of the three irrigation schemes by the time of the survey.

Before independence, the RDCs through the district Commissioners were critical players in the enforcement of by laws, management of pumps and collection of tax revenues from the schemes. Some stakeholders who

were interviewed during the survey weighed the options of adapting the pre-independence model of running the smallholder irrigation schemes to enhance the sustainability of the scheme in the modern day Zimbabwe. However, some stakeholders felt that giving the RDC the responsibility to oversee schemes can open a can of worms for the farmers as they alleged that most RDCs were corrupt and mismanaged. The RDCs played no role in the rehabilitation and management of scheme other than having issues discussed in the full council meetings; allocate schemes for rehabilitation to donors or referring pressing issues about schemes to the relevant Government ministry. It was strongly felt that even if the RDCs might lack money to finance some scheme requirements; its oversight responsibility could go a long way in trying to ensure that the schemes were not allowed to deteriorate. It was widely believed that the Central Government would have interests in having the RDCs oversee these smallholders considering that the Government have invested a lot of money in the schemes and their criticality to the communal subsistence farmers. It was concluded from interviews with the Chipinge and Chiredzi RDCs that as a potential owner of the engagement process in the management of community smallholder irrigation schemes, the RDCs were strategically positioned to determine the level(s) and method(s) of engaging with stakeholders. Considering that some of the critical stakeholders like the department of irrigation and Agritex are poorly resourced and disempowered, RDCs as owners of the engagement would identify where capacity to engage needs to be built and respond appropriately to these needs. This would enable effective engagement to prevent them from participation fatigue and disengagement.

This is in line with sustainability recommendations made for rural development project in India where the local government institutions were tasked with the responsibility to establish a collaborative partnership in developing a local vision and strategy; and designing/planning, allocating resources, implementing and monitoring/evaluating of development projects (Chandrasekera, 2004).

Conclusion

Multiple stakeholders were involved in the smallholder irrigation schemes and the farmer was one of the critical stakeholders in the scheme. The sex and age disaggregation of the farmers in the schemes show that females dominated the schemes and only a few youth participated in the schemes. The absence of the youth had the potential to impose threats to the future sustainability of these schemes as no institutional memory will be left after the current generation of farmers got out of picture (Shah et al., 2002). Over thirty percent of the household had member who were orphans,

chronically and young children who were below 5 years of age. Such a vulnerability status of the households had a direct negative bearing on the viability of irrigation schemes in that, all the vulnerability categories need to be looked after by women who usually provide labour in the schemes (Parker et al., 2009). The illiteracy level of the farmers in the 3 schemes were 18.3% higher than the national average and considering that high value horticultural crops grown in the scheme are usually knowledge intensive and their level of education could not leverage high level of productivity in the schemes. The involvement of farmers in lowly paying casual labour as a source of livelihood was not only eroding their commitment to their irrigation schemes but was also trapping them in a poverty circle.

Some of the IMC were perceived to be ineffective owing to lack of leadership qualities, lack of transparency and the power to operationalize their constitution. Such perceptions determined the farmers' level of willingness to cooperate with the IMC especially on making contributions towards the operations of the scheme. For example, transparency creates an atmosphere in which fraud becomes difficult, increasing the likelihood that the farmers retain control and responsibility for their irrigation schemes- a critical element in sustainability (OECD, 1989; Muparange, 2002; Dzinavatonga, 2008). Although some of the schemes, like Dendere, displayed a remarkable level of cohesion among the farmers, their IMCs displayed functional dissonance as they were failing to take advantage of the farmers' cohesiveness to do group procurement of inputs and group marketing of their agricultural products, for the schemes to sustain high levels of production. The IMCs were generally failing to transform the schemes into commercial production entities to enhance their sustainability. It was also shown that the scheme that had a Marketing Sub Committee had fewer problems in marketing their agricultural produce than those that did not have such a committee.

It was revealed that ZINWA's engagement with farmers lacked materiality. Farmers and other stakeholders felt ZINWA was not fair in its dealings with farmers as they could not understand why this organisation was charging farmers for water they were taking from the river without giving them any help in the water extraction. Also, as a way of forcing farmers to pay their water bills, ZINWA would also disconnect farmers from water supply, when the crops in the schemes will be at a critical water demand. There is, therefore, need for ZINWA to align its operational strategies to the needs of the farmers. This would potentially elicit the needed cooperation and mutual understanding for sustainable engagement. Farmers had the same perception with ZESA whose electricity bill was usually based on inflated estimates and not on actual meter readings. ZESA was charging commercial rates on the electricity for the schemes and was quick to disconnect farmers from the power grid in case of any outstanding bills, at times without verifying

the accuracy of their bills. Consequently, water and electricity bills were the major operational costs threatening the sustainability of the schemes.

Some of the AGRITEX officers lacked the requisite qualification and experience to leverage commercial production in the schemes. Evidence from Dendere and Mtandahwe suggest that farmers were able to motivate their extension workers by respecting them and making them plot holders in the scheme. On the other hand, the Department of irrigation was one of the poorly resourced depart in the district and this prevented from rendering any meaningful support to the smallholder irrigation schemes. ARDA failed to effect a gradual and strategic handover of the Tsvovani farm and its management to farmers, in keeping with the Operate and Transfer model for the scheme. This left a dependency syndrome amongst the farmers as ARDA never empowered them to be independent.

The NGOs that rehabilitated some of the schemes failed to involve farmers on critical strategic issues like the hiring and contracting of service providers. They were also not transparent enough to disclose to farmers, information about the costs incurred during the establishment or rehabilitation of their scheme neither were they also telling the farmers the costs and suppliers of the equipment critical for the rehabilitation of the scheme. This made farmers passive recipients of external assistance which does not only discourage ownership but sustainability of the scheme maintenance. The involvement of the business community in the establishment, rehabilitation and operations of the scheme was very marginal although they had the potential to be strategic partners in different spheres of the scheme.

It was revealed that the engagement process for the multiple stakeholders involved in different aspects of the smallholder irrigation schemes lacked ownership. The responsibility to oversee the sustainability of the schemes is split amongst different stakeholders and there was no one with the responsibility to bring the stakeholder together to enhance cohesiveness, responsibility and accountability in their service to the smallholder irrigation scheme. Although the Rural District Councils were strategically positioned to coordinate the stakeholders, as was the case during the pre-independence era, they were neither a player nor an actor in the smallholder schemes. Consequently, there was no standard way engaging farmers by the multiple stakeholders and the stakeholders lacked supervision.

RECOMMENDATIONS

- 1) The farmers need to be trained in agronomic practices, farming as a business and marketing of agricultural produce for them to transform smallholder irrigation schemes into commercial production entities.

2) The IMCs of the respective schemes need to be trained in group dynamics and transformational leadership to enhance their effectiveness and transparency in leading farmers. There is need for the IMC to be guided by the relevant policies to make the provisions of the constitutions guiding operations in the schemes enforceable.

3) The development agencies rehabilitating and establishing the irrigation schemes should involve farmers at all the critical stages and should aim at seeing the farmers through instead of piecemeal interventions. They should also inform the farmer about the costs involved in either rehabilitation or establishing the schemes as well as the suppliers of the critical equipment needed for the scheme to enhance ownership and sustainability of the scheme.

4) ZINWA and ZESA need to realign their operational strategies to the needs of the farmers to ensure that their billing systems are pro-poor and justifiable. This will elicit the farmers' cooperation and mutual understanding needed for the sustainability of the schemes.

5) Government department like AGRITEX and Department of irrigation need to be adequately trained and resourced to effectively render the necessary support to lead irrigation schemes into commercial production entities. In order to be effective, these two government department need a supervisory board that hold them accountable.

6) It is, therefore, recommended that at district level, there be an adequately resourced government department in the form of RDC, responsible for coordinating the all the affairs of smallholder irrigation schemes. This would be responsible for supervision and holding accountable the multiple stakeholders involved in different aspects of smallholder farmers in a holistic sense. This will not only give an institutional frontage to the farmer when dealing with other organisations but will also ensure that the vulnerable farmers are not exploited.

7) Further research is needed to compare the performance of individually owned smallholder irrigation entities with community owned smallholder irrigation schemes in a view to draw some best practices from both types to inform policies.

Conflict of Interest

There are no conflicts of interests regarding this publication.

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