

SMALLHOLDER IRRIGATION SCHEMES: A COMMON PROPERTY RESOURCE WITH MANAGEMENT CHALLENGES

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Abstract

Smallholder irrigation schemes are common property resources (CPR) faced with various challenges in the use of productive water. This is more so in the light of integrated water resources management, water reform, leading to water being regarded as an economic good and the default handover of the schemes to farmers by government. The sustainability of smallholder irrigation schemes is depends on performance of the irrigation scheme, which in turn is hinged on adherence to CPR concepts. This paper reviews the challenges faced by farmers in smallholder irrigation schemes, with respect to CPR concepts in trying to make use of productive water to sustain their livelihoods. The study considers three irrigation schemes, namely Chakohwa, Nenhowe and Gudyanga irrigation schemes, all in the lower Odzi sub-catchment. The schemes have different technologies that require different levels of organisational intensity, and offer varying challenges to operation and maintenance. Water in these irrigation schemes is regarded as the most limiting factor to production; hence its management is regarded as crucial. The role played by various stakeholders (ZINWA, Agritex and farmers) in irrigation management is reviewed. The way farmers respond to common purpose issues like servicing their electricity bills, maintaining their canals is also considered against a background of their agronomic performance. Common property resources have to be shared equally to avoid chasms within the resource users/ managers. Irrigators at all times want to receive their share of the water so that they feel secure about the investment made (purchase of seeds, fertiliser, labour and energy). Farmers who feel prejudiced in resource allocation feel less motivated; invest less, perform poorly and do not contribute to operation and maintenance costs, which result in the scheme deteriorating. An understanding of how farmers and institutions try to balance the facets of smallholder irrigation management will help in coming up with recommendations for CPR principles that need to be engaged for improved sustainability of irrigation schemes.

Introduction

From the late 1980s until the present, a new paradigm of irrigation development has come to the forefront—the *era of reform*. It is now widely understood that irrigation systems will not be able to perform as needed without basic institutional reform, and this

generally means devolution of some or all responsibility for irrigation management to water users associations (Vermillion, 1999). In today's world of growing competition for water, it is becoming increasingly urgent that society and nations develop equitable property rights for water and enable local communities to manage water services. Smallholder irrigation, by its nature, falls into the reach of a common property resource.

Common property is defined as the co-equal ownership of the rights to a bounded resource where community-established rules govern its use. This common property regime is not a free for all but a structured ownership arrangement within which rules are developed, group size known, and enforced and incentives exist for co-owners to follow accepted institutional arrangements. CPR contributes to rural livelihoods through improved household food security, employment generation and income generation, leading to acquisition of assets. In light of this definition, an institutional structure is essential, without it common property would not be differentiated from open access. Oarkerson (1986), developed a model based on understanding the relationship between the physical characteristics of the resource, the decision making rules of the group/users involve, the patterns of interactions resulting from the appropriation and use of the resource, and the outcomes of this process. Ostrom (1990) in Guveya and Gwata (1998) discusses eight design principles that characterize robust common property resource (CPR) institutions. These principles are:

- i. Clearly defined boundaries: individuals or households who have rights to withdraw resource units from the CPR must be clearly defined, as must be the boundaries of the CPR itself.
- ii. Congruence between appropriation and provision rules and local conditions: appropriation rules restricting time, place, technology, and quantity of resource units are related to local conditions and to provision rules requiring labor, material and/ or money.
- iii. Collective choice arrangements: most individuals affected by the operational rules can participate in modifying the operational rules.
- iv. Monitoring: monitors who actively audit CPR conditions and appropriator behaviour, are accountable to the appropriators or are the appropriators.
- v. Graduated sanctions: appropriators who violate operational rules are likely to be assessed graduated sanctions- depending on the seriousness and the context of the offence- by other appropriators, by officials accountable to these appropriators, or by both.
- vi. Conflict resolution mechanisms: appropriators and their officials have access to low-cost local arenas to resolve conflicts.
- vii. Minimal recognition of rights to organize: the rights of the appropriators to devise their own institutions are not challenged by external government authorities.
- viii. Nested enterprises: appropriation, provision, monitoring, enforcement, conflict resolution, and governance activities are organized in multiple layers of nested enterprises.

In view of the above definition of CPR and the institutional design principles, smallholder irrigation schemes fall into this category of CPRs. Smallholder irrigation schemes have boundaries that are well defined and restricted by the irrigation hardware (canals and pipes). In some cases however, some individuals may decide to deliberately extend the boundaries by irrigating non-designated areas. Resource use in smallholder irrigation is governed by a set of rules established and agreed upon by the farmers/ water users, an aspect of collective choice arrangements. Failure to abide by these operational rules is met by graduated sanctions. Conflicts are a common feature in CPRs and it is invariably so in smallholder irrigation schemes. Conflicts normally stem from resource allocation (especially water) and there are resolved in low-cost arenas, normally comprising the irrigation management committee (IMC), a government institution (Agritex) and local elders (Headmen, Kraal Heads and Chiefs). Water users in irrigation schemes device their own institutions and are not challenged by outside government. This demonstrates the devolution of authority to the water users to manage their resources sustainably.

There are basically three groups of people who have interest in irrigation management. These include government (national policy makers), the farmers (water users) and irrigation service providers (irrigation agencies). Uphoff (1986) outlines the interest of each stakeholder and their apparent role in improving irrigation performance.

Common property rights for water users

Guveya and Miur-Leresche (1995) define property rights as a set of entitlements that define the privileges, obligations and limitations governing the use of resources by individuals and groups of individuals. With the on-going default handover of irrigation scheme management to farmers (commercialization) there is need for efficient property rights to ensure an optimal allocation of resources. Vermillion (1999) lists nine property rights for water user associations, these are:

Water right – The association and individual members have a right to a share of the water supply (of a useable quality) at the point of extraction from the resource base and at the level of individual users.

Right to determine crop and method of cultivation – Individual water users, sometimes constrained by group imperatives, have the right to select which crops they will plant and how they will cultivate them. This is essential if farmers are to have the potential to optimize productivity based on local knowledge.

Right to protect against land conversion – The association has the right to protect its irrigated land against conversion to non-agricultural or non-water use purposes, in the event that the majority of members oppose such conversion. Irrigated land is the main revenue base to finance the association, recover investment costs, and ensure sustainable livelihood for members.

Infrastructure use right – The association has the right to operate, repair, modify or eliminate structures. Without this right, the association is unable or unwilling to invest in long-term maintenance and repair and is likely to consider the infrastructure as the property of the government.

Right to mobilize and manage finances and other resources – The association has the power to impose service fees, establish sideline revenue activities, plan and implement budgets, require labor or other inputs from members, recruit and release staff and provide training. In addition the following may be considered key organizational rights to devote to water users associations:

Right of organizational self-determination – The association has the right to determine its mission, scope of activities (whether single function or multiple function, including businesses), basic by-laws, rules and sanctions and method for selecting and removing officers.

Right of membership in organization – All water users who are eligible for membership according to association by-laws have the right to be members of the association and receive its privileges, services and benefits--as long as they comply with its rules and obligations. This also implies the right to exclude non-members from the service provided by the association.

Right to select and supervise service provider – Where members of the association are unable or unwilling to directly implement the O&M service by themselves, the association may appoint third parties (such as contractors) to implement required services. The association has the right to set the terms of such contracts and supervise service providers.

Right to support services – Subject to government policies or agreed conditions, the association has the right of access to support services it needs in order to function properly. This may include access to credit, banking services, agricultural extension, technical advisory services, subsidies, conflict resolution support and other legal services, marketing assistance, training and so on.

The above rights are the entitlements of water users in an irrigation scheme. These rights clearly distinguish smallholder irrigation as a CPR requiring a sound management system, essential for the sustainability of smallholder irrigation in Zimbabwe. Smallholder irrigation management looks at how the farmers collectively manage the scheme for the sustenance of their livelihoods. According to Jurriens and de Jong (1991), irrigation water management deals with: The organised use of resources (human, physical, financial) for planning, operation and monitoring of tasks and activities related to the water distribution and use for irrigated agriculture, including maintenance, drainage, conflict control and cost recovery, including the organisational structures and communications, all for the realisation of goals and objectives of the organisations and individuals involved. The above definition brings out the various activities that are involved in irrigation management.

Uphoff (1986) identified three facets or domains of irrigation management, namely, the water that is delivered to the crops, the structures that control water to (and from) fields, and the organisations that manage these structures and water. The water delivered to the crops forms the supply and control management which looks at acquisition and allocation (supply management), distribution and drainage (control management). Supply management involves getting the required and appropriate amounts of water for the system and then assigning rights thereto (Uphoff, 1986). Once the water has been acquired, it now has to be allocated, such that allocation matches the available amounts. The allocated amount has to be distributed equally as defined by the CPR concept. Water control within the scheme is achieved through control structures that have to be designed, constructed, operated and maintained. Of late the design component has moved to participatory approach from the traditional top-down approach. This approach involves the water users in the design process hence championing the CPR concept of collective choice arrangements.

Discussion and analysis

Description of study schemes

The schemes selected for the study are Chakohwa, Nenhowe and Gudyanga irrigation schemes. All schemes are surface irrigated but with different water sources and management structures. All schemes are situated in the Lower Odzi Subcatchment and all fall under natural region V. This region is characterised by low erratic rainfall and very prone to mid-season droughts. For these schemes water is regarded as the most limiting factor to production. Water thus tends to be the most managed factor and a source of discords and dissonances in irrigation water management.

Chakohwa Irrigation Scheme

Chakohwa irrigation scheme is situated 73km from Mutare along the Mutare-Birchington Bridge road. The scheme was established in 1936 under the colonial government. When commissioned, it had a command area of 102.4ha, divided between five blocks, A-E. However to date, the scheme only commands about 90ha, block A-D, the remainder, block E has been abandoned because of water shortages. The scheme is jointly managed by Agritex and the farmers, though of late, the farmers have by default gained a greater role in the management of the scheme (finances, hardware and human element).

Nenhowe Irrigation Scheme

Nenhowe irrigation scheme is situated some 90km from Mutare along the Mutare-Birchington Bridge road. The scheme covers an area of 106ha with each farmer holding 1ha of land. It is divided into two blocks, namely Block A (commissioned in 1987) and Block B (commissioned in 1996) of equal hectareage (53ha). Water is abstracted from Odzi River at a fee determined by the Zimbabwe National Water Authority (ZINWA), the irrigation agency supplying water to the scheme. The management is similar to that at Chakohwa, and the farmers are now more active in management issues through the establishment of their own irrigation management committee (IMC). This can be evidenced by their collective ability to negotiate contracts with ZINWA or other companies, e.g., Grain marketing board (GMB) and their ability to service their own operational costs.

Gudyanga Irrigation Scheme

Gudyanga irrigation scheme is situated some 97km from Mutare along the Mutare-Birchington Bridge road. The European Development fund (EDF) under the Small Scale Irrigation Programme (SSIP) developed the scheme in 1996/97. The scheme is farmer managed, meaning the farmers are responsible for all operation and maintenance costs associated with the running of the scheme (JIMAT Report, 2000). The scheme commands an area of about 48ha in size, with each farmer having an average landholding of 0.8ha. Water is drawn from three boreholes sunk along the eastern banks of the Save River. Gudyanga scheme is different from the other schemes in that at establishment; the farmers were given an active role unlike the other two which were wholly government managed on establishment.

Irrigation Activities and CPR concepts

Water allocation

In most smallholder surface irrigation schemes, water allocation is by rotation. A few schemes, especially those using “newer” technologies (e.g., draghose and drip), allow for on-demand water supply. The schemes reviewed are all surface irrigation schemes in which water allocation is by rotation to blocks or to plots (individual farmers). The major problem arising in all schemes is that of inequity in water allocation. Inequity in these schemes arises from deliberate action by unruly farmers to poach water or from poor design of water division structures at the schemes. The deliberate action of water poaching by farmers situated at the head reach is very rampant in most surface schemes and has earned the popular name, ‘top-tail syndrome’ (Tiffen, 1990). Most farmers at Chakohwa and Nenhowe have complained of gross inequalities between farmers situated at the head reach and those situated at the tail reach. Groups and individuals at the tail reach complained that those at the head reach were illegally diverting water intended for the tail end users to irrigate their own crops. This is more so when crop water demands are very high during the summer and the cropped area is over 100%¹. Farmers at Gudyanga have not experienced this since the scheme is small and the rotations are time based and very well defined. This is not so for the other two, where the rotations are not well defined and are based on the farmer finishing irrigating his/her plot before the water is passed on. The on going study at the schemes indicates that the farmers cannot confidently predict their next irrigation turn and as a result cannot schedule and adequately prepare for other activities such as fertiliser application.

Pazvakavambwa (2000) and Tiffen (1990), allege that inequities in water allocation result in variations in incomes received by the farmers. Normally it is those at the head reach who rip more compared to those at the tail end. Farmers who reap less generally tend to invest less in the irrigation venture, in terms of fertilisers and contribution to maintenance. Farmers at Chakohwa’s block C and D (tail blocks), allege that farmers in block A deprive them of water and hence tend to under-produce. This has seen these farmers boycotting payment of irrigation maintenance fees and joint maintenance duties of the supply canal. At block level, farmers at the tail reach of block A complain that those at the head reach poach water intended for them and they spend most of their time moving up and down tracking water poachers.

The issue of equity in water allocation is important under CPR management to avoid chasms between water users in the scheme. To combat inequalities resulting from deliberate water poaching, the irrigation management committees have set up by-laws that if violated, carry a certain fine. The fines were agreed upon by the farmers when they drafted the constitution. At all schemes, the illegal use of water or violation of a rotation system is met by a Z\$500 fine. Such fines are in line with the CPR principle of graduated punishment.

¹ The area exceeds 100% as it includes some small gardens situated along the supply canal

Inequalities resulting from ‘design’ were observed at Nenhowe irrigation scheme. Farmers at this scheme did not appreciate the presence of both the duckbill and fayoum weirs at this scheme. The farmers argued that these structures did not divide water equally between secondary canals and were advocating for their removal. The absence of flow measurement structures at secondary and tertiary levels also raises questions of equity since the flow in these canals is not quantified. Farmers have suggested to Agritex that these structures be removed but have not had a fruitful response. Failure by these farmers to get a response, i.e., have the structures changed demonstrates failure of collective choice arrangements and infrastructure use right under the CPR concept. Agritex control over the scheme hardware limits the farmers’ ability to change some of the set-ups thus depriving the farmers the right to modify or eliminate structures.

Water management

Water management in this case is reviewed at plot level. The way the farmer manages the water that is allocated to him/her is critical for optimal crop production. Most rules laid down on water use at plot level are not usually enforced, e.g., using runoff water to irrigate one’s bananas, sugar cane or *madumbe*. The farmer uses water according to his/her own perceived needs and in most cases does not want to be told what to do with the water that is allotted to them. Farmers are very much aware of their right to a share of the water supply and as such manage their water willy-nilly. Farmers at this level are not monitored (by the water authority, IMC, and other farmers), how effectively they use water that has been allotted to them. The absence of a monitoring mechanism creates a weakness in water management, thus raising questions on sustainability. Poor water management results in reduced crop productivity and in schemes where water is pumped raises the cost of production. Under the CPR principles, there should be a provision for monitors, accountable to the water users to actively audit water use by the farmers. These monitors can be external evaluators (research institutions) or comprise the farmers themselves.

Collective action in irrigation management

Collective action represents the interest of water users in an irrigation scheme. There are basically three types of collective actions that are encountered in irrigation management (Vermillion, 1999). The first is *constitutional actions*, which involves the design and establishment of the group or association, wherein its mission and basic structure of authority and decision-making are determined and adopted. The second type of collective action is about *collective choice*, encompassing the development of rules and sanctions for operations and maintenance of the irrigation system, financing costs of irrigation, settlement of disputes, and modernization and improvement of the system. The third type is *operational actions*, which are the specific decisions and actions in the course of implementing operations, maintenance, financing, dispute resolution, and modernization and improvement of the irrigation system. These three levels are hierarchical: constitutional actions set the conditions and limits within which collective choices occur; collective choices set the limits within which operational actions occur (Vermillion,

1999). Issues discussed in this paper cover some of these aspects, especially the operational actions, to understand the implementation of specific decisions and actions in smallholder irrigation management.

Operation and Maintenance

Largely driven by government fiscal shortages and a common inability to raise sufficient revenues from collection of water and land charges, government has reduced its manpower responsible for maintenance on the schemes and has by default handed it to the farmers. Operation and maintenance (O&M) is crucial for the sustainable running of the scheme leading to better water use and hence improved agricultural output. The two, O&M and agricultural productivity, have a cause effect relationship, i.e., the sustenance of the one depends on the good performance of the other. In the case study schemes, the maintenance of the headworks right up to the scheme edge was a function of Agritex, except for Gudyanga, which was constructed in an era of reform (1997) by a Donor Agency. However to date, Nenhowe has contracted a government authority (ZINWA) to supply it with water, hence this authority is responsible for maintenance of the headworks. For Chakohwa, the labour available from Agritex has been reduced from eight to three workers, who cannot cope with the overwhelming amount of work. This has seen the farmers taking the responsibility of maintaining the headworks, up to the scheme edge. The nature of the supply technology at Gudyanga requires some technical expertise to maintain, since the water is pumped from boreholes and piped to the scheme edge using buried asbestos cement piping. Since the scheme is still new, there have not experienced problems with the piping and have had to deal with scheme canal networks. O&M is not an exactly friendly term for water users as seen at Chakohwa. The farmers absconded canal cleaning duties, choosing to send their children. Of late, the IMC has been cutting all water supplies to the irrigation scheme when maintenance needed to be done. This has managed to increase the numbers attending to maintenance and has been welcomed by most water users. The same has been happening at Gudyanga, no water is pumped on the day set aside for maintenance work. All the farmers are advised to attend since failure to attend will be met by a fine. These above strategies have been adopted by these IMCs to improve on collective actions. The presence of graduated sanctions for appropriators who violate operational rules demonstrate the effort by the IMCs to improve CPR operational principles. Farmers have taken the O&M into their own hands under the infrastructure use right. The farmers have also set-up their own institutions for better implementation of O&M without government interference.

Input procurement and marketing

Input procurement structures are a crucial component of collective actions as they allow for easy access to inputs. Gudyanga irrigation scheme has been introduced to marketing training by the donor agent, which constructed the scheme and this has seen the formation of a marketing committee within the IMC. This committee negotiates contracts with companies, secures inputs and tries to search for good market for the scheme's products. Chakohwa and Nenhowe have very weak or poorly defined marketing structures. In essence, this role is undertaken by the IMC though the IMCs at these schemes of late have not been collectively marketing their wares. Each farmer now does his own marketing and procuring of inputs. This approach defeats the purpose of CPR and CP rights for users.

Conflict resolution

Conflicts are a common feature in CPRs and as such structures for conflict resolution have to be in place. For all schemes, conflicts are handled by a low-cost arena comprising the IMC and local headman. These arenas were basically set to deal with conflicts relating to water allocation and to deal with unruly water users in the scheme. Some cases involving theft are sometimes handled by the police upon recommendation by the IMC. Most of the conflicts arise mainly from water sharing between the farmers. Farmers threaten each other with witchcraft and this instills fear in the 'weak' farmers. These threats are taken to the local traditional courts that then deal with these farmers. Agritex staff at Chakohwa responsible for water allocation have at times failed to execute their duties for fear of being bewitched (Samakande, 2000). The water allocation has to be handed over to the farmers, like is the case at Nenhowe and Gudyanga. The people who allocate water are from the scheme and from the local community and as such are not easily tossed around. Allowing the farmers to run the whole show gives them the right to organisational self-determination, an essential component for efficient CPR management.

Conclusions

The foregoing discussion has indicated the aspects/facets involved in smallholder irrigation management. These basically comprise the water delivered to the crops, the structures that control water to (and from) fields, and the organisations that manage these structures and water. These facets fall into or relate to issues to do with CPR management. Smallholder irrigation management has challenges that bear resemblance to those faced in CPR management. The operational and solution techniques to the challenges can be likened to CPR management proving that indeed smallholder irrigation management is a CPR with management challenges. Effective application of CPR management principles to smallholder irrigation management has the potential to lead to effective irrigation management. Under the current devolution and decentralization exercise of smallholder irrigation management, it is important that farmers put in place proper monitoring and evaluation mechanism to ensure the efficient use of resources (water and infrastructure). It should however be appreciated that the farmers have tried to enforce enacted bylaws through the use of graduated sanctions, a principle essential for efficient CPR management. Farmers should also be fully empowered with infrastructure use rights, i.e., be able to operate, repair, modify or eliminate structures. Currently, part of this right (operation and maintenance) is exercised by the farmers. This has led to unwillingness to invest in long-term maintenance and repair as they regard infrastructure as government property. Generating a sense of ownership will lead to better investment and proper management of this common property resource.

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