

Full Length Research Paper

Methodological framework for revitalisation of small-scale irrigation schemes in Southern Africa

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This paper presents a methodological framework for revitalising small-scale irrigation schemes which are no longer performing well due to a combination of infrastructural, social-economic, institutional and governance problems, among others. The framework was developed as part of a project to revitalise small-scale irrigation schemes in Masvingo Province in Zimbabwe. The framework is based on the understanding that an irrigation scheme consists of four mutually interlinked systems: the physical system, the cropping system, the economic system and the social-organisational system. The methodological framework combines both hardware and software rehabilitation processes to lead to a comprehensive revitalisation of an irrigation scheme. The framework consists of systematic steps which lead to achieving predetermined outputs, which then lead to intermediate outcomes and goal outcomes. The framework has indicative timelines for the steps. The application of the proposed framework and the hypothesis that improved understanding of existing scheme and improved training of farmers which result in sustainable and improved performance of revitalised irrigation schemes are yet to be investigated. However, the authors invite reaction of readers on the proposed methodological framework.

Key words: Irrigation revitalisation, small-scale irrigation scheme, methodological framework, diagnostic studies.

INTRODUCTION

Africa has promoted small-scale irrigated agriculture as a means of ensuring food security as well as improving the standard of living of the rural people for many years (Hillel, 1997). Various studies have shown that small-scale irrigation improves food security and livelihoods of rural farmers in Africa (You et al., 2010; Oni et al., 2011; Chazovachii, 2012). However, despite their important role in improving livelihoods of rural communities in Southern Africa, small-scale irrigation schemes have had limited performances of operating irrigation systems; generally, this has averaged less than 50% efficiency (Podmore, 1983) due to poor infrastructure, limited knowledge of crop production among smallholders, limited farmer participation in the management of water, ineffective extension and mechanisation services and lack of reliable markets, effective credit services, predominance of subsistence-oriented farming (Backeberg et al., 1996; Bembridge, 2000; Crosby et al., 2000; Arcus, 2004). A recent World Bank study (Briceño-Garmendia et al.,

2008) indicated that about 30% of the irrigation infrastructure assets in sub-Saharan Africa need revitalisation.

It is generally argued that there is great potential for revitalising existing irrigation systems in the southern Africa region and that the costs of such interventions are lower than constructing new systems (Bembridge, 2000; Inocencio et al., 2005; Riddell, 2005; Briceño-Garmendia et al., 2008). This is why the Southern Africa Development Community (SADC) considers revitalisation of existing systems important for the agricultural development of the region (SADC, 2006). Small-scale irrigation schemes have the potential to make a significant impact on improving the livelihoods, food

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security and reducing poverty in the region. The methodological framework for revitalisation of small-scale irrigation schemes was developed as a tool for unlocking this great potential of existing small-scale irrigation subsector in southern Africa region. The framework was developed as part of a project to revitalise irrigation schemes in Masvingo Province, Zimbabwe.

METHODOLOGICAL FRAMEWORK FOR REVITALISING AN IRRIGATION SCHEME

Rehabilitation and revitalisation of irrigation schemes

According to Denison and Manona (2007a, b), rehabilitation is an engineering-centred approach while revitalisation is a people/systems/market-centred approach. Wijayarathna (1988) defined rehabilitation as the restoration of physical structure to original specification in which case it is also viewed as an extended maintenance activity which takes place periodically and involves high costs than routine maintenance. Rehabilitation focuses more emphasis on the improvement of physical infrastructure while revitalisation is a more comprehensive approach, encompassing the development of both physical capital and social capital that provide complex systems to use irrigation water (Neeraj et al., 1998; Denison and Manona, 2007a, b). Rehabilitation involves minimal engagement with the organisational dynamics of water apportionment, the agricultural production system, farmer learning process, financing and markets. Denison and Manona (2007a, b) defined "rehabilitation" as the more engineering-centred reconstruction of dilapidated infrastructure and is focussed primarily on securing the water supply repairing of the irrigation distribution system. Rehabilitation interventions tend to have minimal engagement with the organisational dynamics of water apportionment, the agricultural production system, farmer-learning processes, finance and market.

Revitalisation emphasizes human capital development both individually and organisationally, empowerment, access to information, marketing and business strategy development, alongside repair and re-design of existing infrastructure. Revitalisation is underpinned by a financially sustainable development strategy alongside repairs and re-design of existing infrastructure (Denison and Manona, 2007a, b). In this proposed framework, revitalisation refers to complete revamp of the hardware and software components of the irrigation system while rehabilitation refers to the process of revamping the hardware of the irrigation schemes.

Approach to formulation of the framework

The approach of the proposed methodological framework to revitalising an irrigation scheme is based on the concept of Podmore (1983) that describes an irrigation

system as composed of interrelated mutually dependent components: physical component, a cropping component, economic component, and a social-organisational component. The physical component consists of the irrigation infrastructure while the cropping component consists of the natural, biological, and chemical environment of crop production. Proper soil and water management practices are key elements in the management of irrigated cropping systems, both for sustainability and productivity of small-scale irrigation schemes (Fanadzo et al., 2010). The economic component covers issues of maximization of profits, inputs, outputs, marketing, and allocation of resources. And the socio-organisational component is a system of relationships, organisational influences which affect human behaviour that looks at the whole aspect of governance as it deals with legislative, policy and institutional frameworks. The physical and cropping components are grouped into hardware component while the economic and socio-organisational components are made up of what is commonly called the software component of the irrigation system. From a dynamic perspective, an irrigation system is composed of a resource (sources of water), physical infrastructure (storage and canals or pipelines), actors who manage and appropriate from the resource (farmers and irrigation managers), and a governance structure that regulates the action and interaction of the actors (irrigation institutions) is an example of a social-ecological system (SES), the main feature of which emerge from the interactions of actors within the system (Miller and Page, 2007; Mitchell, 2009; Ostrom, 2009; Pradhan, 2012). Its dynamics are activated by human and biophysical processes at multiple spatial and temporal scales and scopes that often generate complex positive feedback loops (Ostrom, 2009; Miller and Page, 2007; Mitchell, 2009).

The proposed methodological framework

The rehabilitation framework presents the steps and processes taken to embark on and implement rehabilitation of small-scale irrigation schemes. The approach considers rehabilitation in the broader context of integrated land and water resources management. This approach stresses the need for an all-inclusive process which begins with extensive stakeholder consultations and ends with putting in place a robust sustainability plan to ensure that the benefits of rehabilitated irrigation scheme are not short lived. One of the key elements of the framework is to set diagnostic studies which are conducted to define the rehabilitation process (Figure 1). The main element consists of steps from stakeholder consultation, diagnostic studies, defining the terms of reference (TOR) for revitalisation and the actual revitalisation process (Figure 2). A brief explanatory statement in respect of each of the sequential steps in the framework is given as follows.

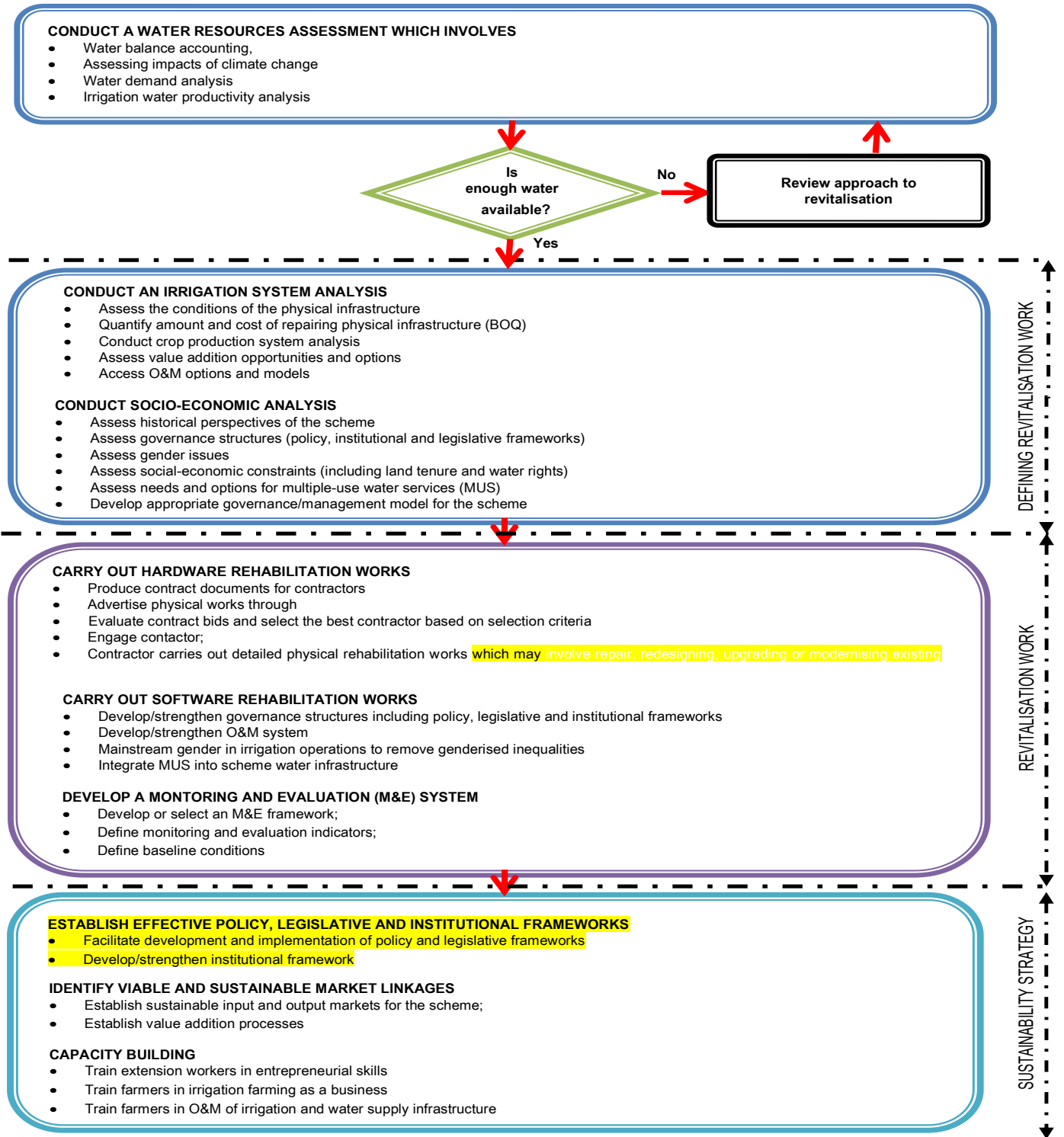


Figure 1. Diagnostic studies used for definition of the revitalisation of small-scale irrigation schemes.

Key steps

Step 1 - Identify stakeholder and conduct extensive stakeholder consultations: Stakeholder consultations

are conducted to enlist vital stakeholder support and input in the implementation of the rehabilitation process. The other important reason for stakeholder consultations is to ensure that there is effective buy-in of the project by

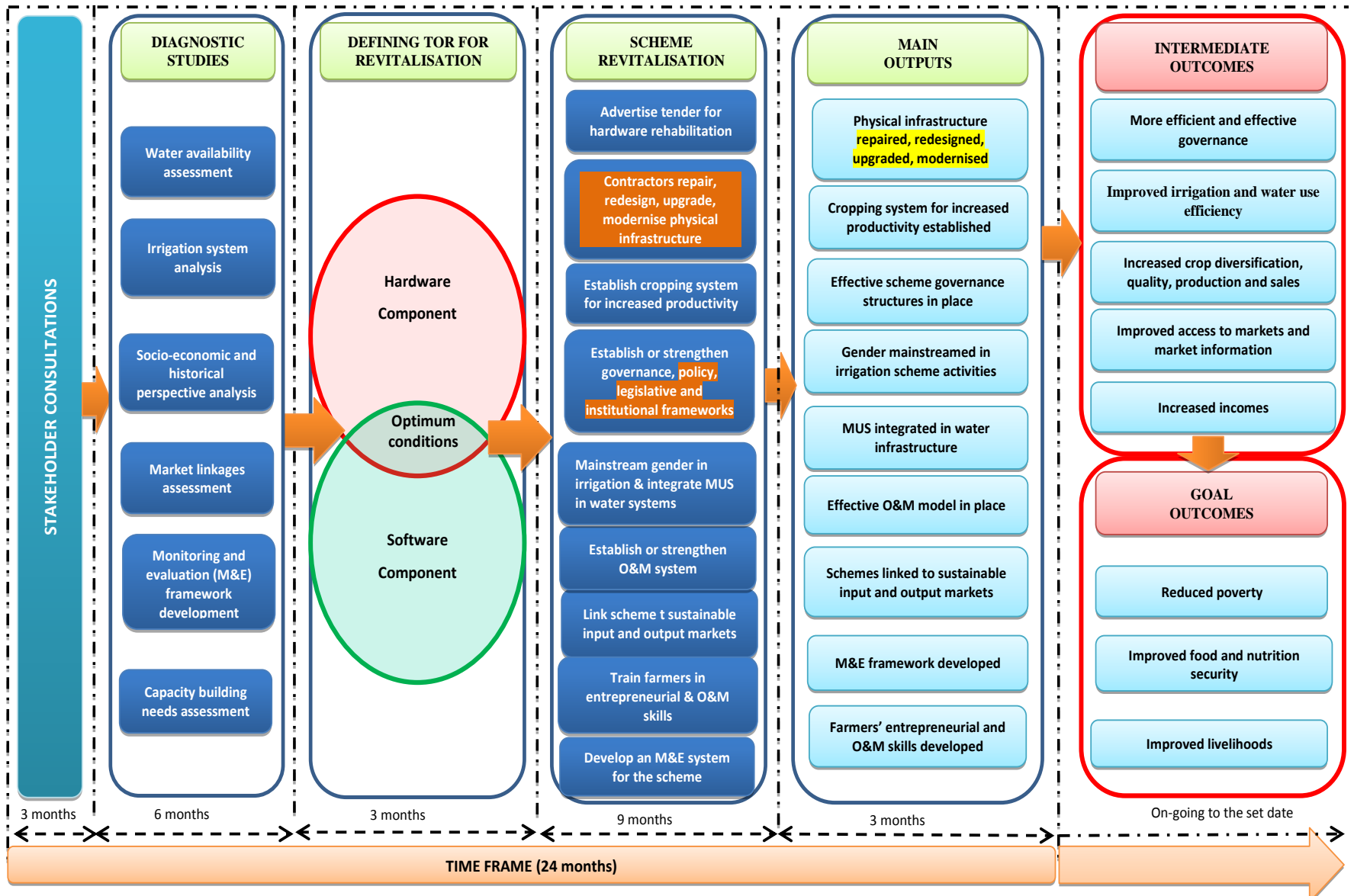


Figure 2. Methodological framework for revitalising small-scale irrigation schemes.

all levels. Project ownership by beneficiary institutions and communities is crucial to its success.

Identification of and consultations with stakeholder should be initiated at the start of the revitalisation project. In this study, while stakeholder consultation is a continuous process, identification and mobilisation of stakeholders and securing their buy-in of the revitalisation intervention were achieved within three months of the start of the project. This is considered the minimum period but the time can be longer depending on the nature of the scheme.

Step 2 - Carry out diagnostic and baseline studies:

The baseline diagnostic and analytical studies provide an objective basis for defining the most favourable social-economic conditions and the most appropriate methodology for rehabilitating the schemes in a sustainable and profitable manner. In this study, this component includes five main study areas: (a) water availability, (b) irrigation system analysis, (c) socio-economic analysis, (d) historical perspective analysis, and (e) market linkages study. It is imperative to stress that availability of sufficient water to meet the needs of the revitalised irrigation scheme is a condition for proceeding with the rehabilitation as indicated in Figure 1. In this case, the time allocated to conduct the diagnostic studies was 6 months. Again, this could be considered the indicative timeline and the actual time may vary depending on the required details for defining the revitalisation process.

Step 3 - Define the terms of reference (TOR) for the rehabilitation of the scheme:

The results of the studies provide the basis for defining how and what should be revitalised in the scheme. Revitalisation process involves working on the hardware and software components of the scheme. One of the activities under irrigation system analysis is to assess the amount of physical damage on the physical infrastructure and the cost of repairing or replacing components of the damaged infrastructure. This involves compiling bills of quantity for the physical rehabilitation. This information is used to draw up the terms of reference for physical rehabilitation work. In this framework, it is stressed that sustainable revitalisation can be achieved only when both the software and hardware components of the scheme are worked on. This is the optimum condition which should be the target for the rehabilitation process of a scheme. The process of defining the TOR for the revitalisation took 3 months in this study, but in some cases the actual time may be longer or shorter than this period.

Step 4 - Carry out software and hardware rehabilitation work:

As indicated in "rehabilitation and revitalisation of irrigation schemes", hardware rehabilitation as part of revitalisation process may involve redesigning, upgrading or modernising existing infrastructure. Such work requires services of competent

civil engineering companies. Hence, the procurement of such services involve tendering process which has to be conducted according to guidelines and procedures prescribed by the host government and/or the funding institution.

The software rehabilitation involves establishing and/or strengthening scheme governance structures. This includes facilitating establishment of policy, legislative and institutional frameworks required to create enabling environment for improved and sustained performance of the revitalised systems. Where this is not possible, the revitalisation process should provide practical recommendations and guidelines for developing and putting in place the necessary policy, legislative and institutional frameworks to support revitalisation process.

Putting in place an institutional framework includes establishing and operationalizing a viable farmer organisation to manage the scheme. In this case, either of the pilot schemes has an irrigation management committees (IMC) which operates as the management institution. Hence, part of the software rehabilitation involves overhauling and strengthening the IMC.

Software rehabilitation also involves reviewing and putting in place appropriate land tenure system and mainstream gender issues in all scheme operations. It also involves reviewing national policy and legislative frameworks and ensuring that they provide enabling environment for increased productivity under the rehabilitated conditions. Another important software component is linking the scheme to viable and sustainable markets for its produce as well as inputs. The final activities in software rehabilitation involve developing scheme management and operation and maintenance models which will characterise the functions of the rehabilitated irrigation scheme.

Step 5 - Develop and put in place a sustainability strategy:

This step involves developing and implementing appropriate strategies that will sustain of the expected improved productivity of the rehabilitated irrigation scheme. One of the strategies is to be able to constantly track the performance of the rehabilitated scheme against predetermined baseline conditions. This is done by putting in place a monitoring and evaluation (M&E) system. The second strategy is to develop the capacity of the farmers so that they will be able to utilise and benefit socially and economically from the rehabilitated irrigation scheme. A very important capacity element is to inculcate entrepreneurial skills into the irrigation farming culture so that farmers are able to take irrigation farming as a business. The farmers are also trained in all basic O&M principles and practices. Hence, training of farmers in irrigation farming as a business as well as in O&M is an essential component of capacity building of the farmers which will contribute to sustainability of the rehabilitated irrigation scheme. Development and implementation of sustainability strategies are generally on-going processes. The initial

training sessions for the farmers were conducted within the period of 12 months from the onset of the revitalisation project.

Existence of effective policy, legislative and institutional frameworks is one of the most important determinants of sustainability of a revitalised irrigation scheme. This is where the national government comes in as a very important partner in the process of sustainable revitalisation of small-scale irrigation schemes. Hence, in revitalisation of small-scale irrigation schemes, the role of the national government is, among other things, to create enabling institutions, policies, laws and regulations which ensure that the improved performance of the revitalised irrigation schemes is sustained.

Main outputs

The rehabilitation of the physical infrastructure of the irrigation scheme results in an improved physical infrastructure in terms of water delivery and application and a cropping system which will increase productivity of the scheme. The software rehabilitation results in a more effective governance structure, promotion of multiple usages of water and gender issues clearly mainstreamed in all scheme operations. The timeframe for realising the main outputs from the intervention in this study was 3 months.

The outputs of the sustainability strategy are an appropriate M&E system which will enable the schemes to track the performance of the scheme, and an effective O&M system for ensuring that the irrigation infrastructure and a business culture are inculcated into the farming practices.

Main outcomes

Intermediate outcomes: It is expected that the outputs will lead the scheme to achieving its intermediate outcomes. In this case, the expected intermediate outcomes include efficient and effective governance structures, improved irrigation and water use efficiency, increased crop production, improved access to markets and market information and increased incomes. These are the outcomes to be achieved in the cropping seasons immediately after rehabilitation of the scheme.

Goal outcomes: The intermediate outcomes will lead to achieving the goal outcomes. In this project, the goal outcomes include reduced poverty, improved food and nutrition security, and improved livelihoods of the farmers.

The timeframe for the outcomes is normally set in the goal for the project. Hence, these are often achieved at a much later date after the intervention has been complete. In this case, the project goal was to ensure that rural communities in dry areas from Masvingo Province enjoy food security, enhancing livelihoods, income and nutrition of rural households through a sustainable management

of revitalised irrigation schemes by 2020. Hence, the timeline for goal outcomes are on-going up to 2020.

CONCLUSION

There is a general consensus that improving agriculture and enhancing agricultural productivity through small-scale irrigation is one of the key strategies for alleviating poverty and improving livelihoods of rural communities in southern Africa where the majority of the rural poor depend directly or indirectly on agriculture. It is also agreed that most of the small-scale irrigation schemes in southern Africa have performed poorly and have not delivered on their development objectives of improving rural livelihoods through sustainable crop production for food security and poverty alleviation. Effective and sustainable revitalisation of existing irrigation schemes is one of the ways of improving the performance of the small-scale irrigation sub-sector in the region.

A methodological framework for sustainable revitalisation of small-scale irrigation schemes is proposed. The proposed framework is based on the understanding that an irrigation scheme consists of the physical system, cropping system, the economic system and the social-organisational system. The physical and cropping systems constitute what is known as the hardware components while the economic and social-organisational systems constitute the software components.

The framework is divided into four main steps: stakeholder consultations, diagnostic studies, defining terms of reference for revitalisation process, and actual scheme revitalisation work. It also includes developing sustainability strategies. The framework steps have timelines based on the initial development of the framework as part of project timelines for revitalisation of irrigation schemes in Zimbabwe.

The application of the proposed framework and the hypothesis that improved understanding of the existing scheme coupled with improved training of farmers result in sustainable and improved performance of revitalised irrigation schemes are yet to be investigated. However, the authors invite reaction of readers on the proposed methodological framework.

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DISCLAIMER

The contents of this article are the sole responsibility of their authors and can in no way be taken to reflect the views of the Swiss Agency for Development and Cooperation / Rehabilitation of Small Irrigation Schemes in Zimbabwe Project.

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