

**Attaining Sustainable Smallholder Irrigation-farming
and Rural-livelihoods through Social-capital: Post Fast-
Land-Reform (FTLR) Perspectives from Rozva Irrigation
Scheme, Bikita, Zimbabwe**

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Abstract

This article examines social-capital's contribution towards improving smallholder irrigation-farming, which is one of the primary means of subsistence in rural areas due to climate change under the Zimbabwe National Development Strategy (NDS) 1 policy's human capital development cluster. This descriptive case-study used semi-structured questionnaires, focus groups,

key informant interview data from 100 irrigation farmers. It concludes that social-capital is essential for sustainability through trust and solidarity, social norms and connections, communication and information sharing, collective action, rules and regulations, effective sanctions, and partnerships with institutions. It underscored that social-capital increases effective water management, informal financial insurance, social cohesion, farm profitability, effective governance and rehabilitation, and irrigation infrastructure. The results of this study are useful to communal and irrigation farmers, traditional and government leadership. The article recommends deliberate configuration of social-capital for smallholder irrigation programs to contribute significantly to food security and sustainable livelihoods.

Key Words: *Sustainability, social-capital, smallholder-irrigation, farming-administration, rural-livelihoods*

1. Introduction

Post the Fast-track land reform programme, demand for water continues to rise rapidly, particularly in agriculture where thousands benefitted from land acquisition, creating more competition for access to limited and scarce water resources (Nhundu, 2013). Therefore, every nation in the world must select a suitable strategy for managing water resources, allocation, and distribution in order to achieve sustainable agriculture (Ncube, Moyo and Mamhute, 2021; Inthakesone and Syphoxay, 2021). Irrigation is the most well-known method of storing or preserving water, and it is a key component of agricultural growth since it increases agricultural productivity, guarantees food security, and lowers poverty (Inthakesone and Syphoxay, 2021; Nonvide 2019; 2018). The direct results of irrigation's land-augmentation effects are improved productivity, jobs, incomes, consumption, and other social aspects at the micro- or household-level (Ncube et al., 2021; Nguyen and Nguyen, 2016; Dube, 2016). That is why the administration and expansion of irrigation is essential for a nation where agriculture provides the majority of employment opportunities. According to Inthakesone and Syphoxay (2021), Smith (2007), Tapela (2008), and others, establishing smallholder irrigation schemes in rural areas is thought to be a potent tool for achieving sustainable livelihoods and reducing poverty through income generation, agricultural improvement, and opportunities for livelihood diversification.

Accordingly, the Government of Zimbabwe, non-governmental organisations (NGOs) and the private sector have undertaken a number

of initiatives aimed at sustaining smallholder irrigation schemes (Zaweet al., 2015). These included the National Farm Irrigation Fund (NFIF), Accelerated Irrigation Rehabilitation and Development Programme (AIRDP), Extension services, availing of funding for smallholder irrigation rehabilitation, purchasing of equipment and training of farmers (Zaweet al., 2015). The above initiatives were largely directed towards financial, physical and human forms of capital; however, they paid little attention to the essence of social-capital in the achievement of sustainability of crop farming in the smallholder irrigation-farming sector. Sustainability of livelihoods remains a topical issue in the domain of rural development, poverty reduction and development studies given the growth in thinking towards sustainable development (Scoones, 2016). However, smallholder irrigation-farming in Zimbabwe continues to be affected by external shocks at individual and household levels (Cardenas *et al.*, 2017), which necessitates harnessing social-capital.

Social-capital has however, been one of the mainstays of rural livelihoods sustainability which can be traced to the existence of human beings (Kirori, 2015). Additionally, He, Guo, Deng & Zhou (2022) argue that the idea that social-capital can guide economic activity dates back to the 18th century during the period of the enlightenment. In appreciation of the value of social-capital in development, the World Bank developed the Social-capital Initiative in 1996 to help define and measure social-capital in better ways as the basis for designing better development interventions which can both safeguard existing social-capital and promote the creation of new social-capital (Naithani & Saha, 2021; Sorensen, 1998).

The article is underpinned by Social-Capital Theory, as read with the comprehensive Sustainable Livelihoods Framework that articulates the importance of five capitals (natural, physical, economic, human and social) in addressing rural poverty. It highlights the utility of social-capital in addressing human vulnerabilities through administrative policy interventions that unlock governance benefits and increases access to and utilisation of pentagon capitals towards sustainable-livelihood strategy-mix that yields sustainable outcomes (Nguyen and Nguyen, 2016; Dube, 2016). This article highlights the contribution of social-capital to the governance of irrigation schemes and sustainable production among rural farmers, with specific focus on Rozva Irrigation scheme in Bikita district, Masvingo Province, in Zimbabwe.

2. Literature Review

2.1 Theoretical Framework

2.1.1 Social-capital Theory

Social-capital theorists, including Field (2016), Rogošić & Baranović (2016) have developed various connotations underpinning the social-capital theory and its utility in people's daily lives. According to earlier research, the foundation of social-capital theory is the idea that people are part of a network of social relationships that impact their choices and behavior (Granovetter, 2018). Between Adam Smith's individualistic rationality and self-serving ideas and Levi Strauss' structuralism, the perspective of social-capital theory is situated (Granovetter, 2018; Rogošić & Baranović, 2016). According to Rogošić & Baranović (2016), the fundamental tenet of social-capital theory is that capital is captured in social connections and that this capture results in both structural possibilities and limitations as well as individual actions and choices. In this study, the theory connotes the idea that social relations create opportunities for smallholder irrigation farmers to co-operate and synergise their combined social strength beyond household capacities and limitations to positively influence their choices of actions.

2.2 An Overview of the value of smallholder irrigation-farming to rural livelihood in Zimbabwe

Most developing countries, including Zimbabwe, have adopted irrigated agriculture as an essential strategy towards attaining United Nations Sustainable Development Goals (SDGs) 1 and 2, whose achievement guarantees food security and poverty reduction by the year 2030 (Mupaso, Makombe and Mugandani, 2023; McCartney, Whiting, Makin, Lankford and Ringler, 2019; Hanjra and Williams, 2020). While SDG Goal 1 emphasizes poverty reduction, and SDG 2 seeks to end hunger and improve nutrition and food security (Mupaso et al., 2023), the persistence of issues related to food insecurity, malnourishment, hunger, and poverty has spurred research on how these issues, along with growing climate variability, biodiversity loss, and degradation of ecosystem services, are endangering the achievement of Sustainable Development Goals 1 and 2, respectively (Mupaso et al., 2023; McCartney et al., 2019). lingering challenges of food insecurity, malnutrition, hunger and poverty have increased research traction on

increasing climate variability, land, and biodiversity loss, and ecosystem services degradation, thus, threatening the attainment of SDGs 1 and 2 respectively (Mupaso et al., 2023; McCartney et al., 2019).

That way, irrigation has been pivotal in Zimbabwe's agricultural sector since the colonial period (Mhembwe, Chiunya and Dube, 2019; Muzerengi and Mapuranga, 2017), seeing that by 1980 about 150,000 hectares of Zimbabwean land was already under formal irrigation schemes (Mhembwe, Chiunya and Dube, 2019). Increased smallholder irrigation-farming development is a critical drought mitigation measure as well as a vehicle for long-term agricultural and macro-economic development (Muzerengi and Mapuranga, 2017). Additionally, raising productivity and incomes of smallholder farmers was noted as the most direct route towards achieving agricultural growth in Zimbabwe through irrigation (Mhembwe et al., 2019; Muzerengi and Mapuranga, 2017).

Hence, after independence, the government of Zimbabwe sought to expand smallholder irrigation schemes through block schemes centrally managed by the State through the Ministry of Agriculture directing planting of crops and allocation of water (Moyo, Van Rooyen, Moyo, Chivenge and Bjornlund, 2017). Despite their critical role in the livelihoods of most Zimbabweans, irrigation schemes continue to face a plethora of capital challenges, including poor administration and social capital management. Moyo et al. (2017) argue the failure of irrigation schemes in Zimbabwe was a result of poor planning and management, lack of group cohesion, and low technical capacity. Similarly, inadequate water delivery, weak governance institutions, sub-standard infrastructure, significant land degradation and lack of conducive irrigation environment are some of the challenges faced by smallholder irrigation schemes (Moyo et al., 2017; Mujere *et al.*, 2011). It is crucial to acknowledge that smallholder irrigation schemes in Zimbabwe face numerous challenges, with more failures than successes being reported (Jacobs *et al.*, 2013). The government of Zimbabwe therefore seeks to increase food security and crop production in rural areas and the country at large through small irrigation scheme development (Jacobs *et al.*, 2013).

Smallholder irrigation-farming remains critical to the sustainability of rural livelihoods in semi-arid regions including Zimbabwe (Food and Agriculture Organization and World Water Council, 2015). This view is supported by Mutiro and Lautze (2015) who argue that improving agriculture through smallholder irrigation is a key poverty alleviation strategy used by developing countries where the majority of rural communities and poor communities depend on agriculture. Zimbabwe is divided into five natural agricultural regions, with Natural Regions III, IV

and V categorised as semi-arid regions where rainfall is erratic and unreliable, making supplementary irrigation-farming key for successful agriculture, food security and reduced hunger, poverty reduction and sustained livelihoods (Moyo *et al.*, 2016).

The Government of Zimbabwe has adopted a number of approaches to ensure irrigation is prioritised (Scoones *et al.*, 2019). For instance, in Masvingo province, there are currently about 60 schemes averaging about 54.6ha each, making up 0.08 % of the total area (Scoones *et al.*, 2019). Scoones argues the proliferation of smallholder irrigation schemes was necessitated by the growing concerns of national food security, and the need to improve recently occupied land appropriated from former white settlers during the Fast-Track-Land Reform (FTLR). For instance, from 2016 the command agriculture programme became the flagship for agriculture development including irrigation schemes rehabilitation through donor support in form of irrigation equipment (Scoones *et al.*, 2019). Consequently, exploring the benefits of using social-capital to sustain irrigation schemes is insightful to finding solutions to some of these challenges noted.

2.3 Positive Contributions of Social-capital to Sustainability of Smallholder Irrigation

This section review literature on then positive contribution of social-capital and cohesion to sustainability of irrigation schemes.

2.3.1 Solving Common Pool Problems

Higher levels of social-capital in communities enhance the ability of actors to take action that minimises negative consequences of over-exploitation and under-maintenance of common pool resources such as water in irrigation schemes (Wang and Huan, 2023; Call, 2017; Baylis, Gong & Wang, 2013). They further note that social-capital facilitates the resolution of collective problems through facilitating cooperation, which is essential for effective management of common pool natural resources that ensures sustainability, the ability to continuously draw from the resource that sustains rural livelihoods (Wang and Huan, 2023; Muchapondwa, 2018; Call, 2017). This view is reinforced by Mhembwe *et al.* (2019); and Muzerengi and Mapuranga (2017) who underscore how instrumental shared values, worldviews, and existing social-capital dimensions are in solving common pool problems among irrigation schemes. Citing Ostrom (2008), Wang and Huan (2023); Muchapondwa

(2018); and Call (2017) variously highlight how rules setting boundaries, shared sanctions, rights and responsibilities has proven successful in solving common pool problems. In a critique of the tragedy of the commons theory, Ostrom (2008) noted that failure to exclude potential users from common pool resource often results in exhaustion of those resources than conserve for the benefit of all. Water and channels of water which need to be regularly maintained with the costs shared by users are the most common pool resources in irrigation systems (Wang and Huan, 2023; Muchapondwa, 2018; Bravo and Marelli, 2008).

2.3.2 Lowering Transaction Costs

Wang and Huan (2023); Muchapondwa (2018); Bravo and Marelli (2008) variously highlight how social-capital increases efficiency of action by reducing the costs of transactions and it encourages cooperative behaviour which facilitates the development of new forms of association and innovation, leading to the development of intellectual capital. Earlier literature indicated that social-capital lowers transactional costs by reducing information and search cost as well as through trust that cuts down administrative costs (Jacques, Marinho, d'Andrimont, Waldner, Radoux, Gaspart and Defourny, 2018). Pokhriyal and Jacques (2017) argue the reduction of transactional costs is important for food security as it impacts directly on farmers' income. Similarly, transactional costs have been cited as the most significant barrier that prevents smallholder farmers from gaining access to markets which lowers farm profitability (Jacques *et al.*, 2018). It is clear that a number of scholars concur with the view that social-capital is important in lowering transaction costs.

2.3.3 More Efficacious Governance

Government efficacy in irrigation systems is also improved through better horizontal relationships (bridging social-capital) and vertical relationships (linking social-capital) (Baylis, Gong & Wang, 2013). Governance of smallholder irrigation systems has attracted attention in recent years given their vulnerability to external shocks and disturbances (Araral, 2013; Yu *et al.* 2015; Villamayor-Tomas, 2017). Various forms of social-capital such as trust and cooperation within the irrigation system enhances the enforcement of adaptive and low-cost governance in face of the various shocks and stresses (Chai, 2018). Furthermore, Chai (2018) highlights that social-capital enables community to absorb power from the local government and internalise it, enforce incremental changes and

efficiently realise a robust irrigation system with more efficacious and adaptive governance characteristics.

2.3.4 Diffusion of Innovations

Social-capital increases the diffusion of innovations through information sharing among community members (Wang and Huan, 2023; Muchapondwa, 2018; Call, 2017). Thus, building of social-capital among smallholder irrigation farmers can positively impact the adoption and diffusion of new technologies such as the use of improved seeds, soil and water conservation and agro-forestry (Levidow *et al.* 2014). However, when incorrectly applied irrigation technology can affect the overall sustainability of irrigation systems (Battilani, 2012). Proper technical advice is therefore critical for effective utilisation of technology and innovative ideas (Levidow *et al.* 2014). Strong social cohesion and connectivity foster trust, which promotes information sharing and lessens risk aversion (Beddington and Warham, 2014). According to Levidow (2014), irrigation systems that are creative can improve water efficiency, yield financial benefits, and lessen their negative environmental effects, all of which are essential for irrigation systems to be sustainable. According to Hunecke *et al.* (2017), official and informal networks as well as trust institutions have a favourable influence on the uptake of innovative irrigation technologies.

2.3.5 Informal Insurance

Robust social networks can act as a safety net, helping groups and individuals with limited resources deal with setbacks, particularly in situations where formal risk management tools like insurance or credit aren't available (Baylis *et al.*, 2013). Farmers follow strict norms and customs and those who deviate and default face social sanctions such as exclusion from the community and loss of kinship (Sun *et al.*, 2018). Smallholder farmers with kinship social-capital value its significance in informal borrowing and an important determinant of the ability to access informal loans (Kinnan and Townsend, 2009). Similarly, Sun *et al.* (2018) note that within the Chinese context kinship is an informal institution with stable social-capital which is vital for rural smallholder farmers in accessing loans as collateral is often unavailable. Additionally, in the Sub-Saharan Africa context, Lefore *et al.* (2019) highlight that formal groups and associations among smallholder irrigation farmers enable them to access informal loans and credit facilities.

2.3.6 *Collective Action*

In a study carried out in ten irrigation schemes across in Zimbabwe, FAO (2000) indicates that projects in irrigation schemes where farmers cooperate does very well as cooperative action is important in activities such as marketing, hiring of transport and organization and management work. Social-capital helps bring farmers together to organise operations and maintenance of irrigation systems infrastructure (FAO, 2008). Muchara *et al.* (2014) highlight how essential collective action is in managing water resources as farmers need to cooperate to maximise the resource benefits. The above narratives indicate that higher levels of social-capital through social trust and social participation can lead to a higher propensity of collective action among irrigation farmers (Miao *et al.*, 2015). Inferring from these arguments it can be noted that social-capital enhances the achievement of collective action which is a vital resource in water management and irrigation infrastructure.

4. Methodology

The article was based on the constructivism research paradigm, which holds that human practices are created through interactions between people and their environment, and are primarily developed and transmitted within social contexts. This means that all knowledge, and therefore all meaningful reality as such, is dependent on these interactions (Kivunja and Kuyini, 2017; Denzin & Lincoln, 2011). It adopted a qualitative research approach through inducting Rozva irrigation-farming communities' perspectives to the study since reality of life can only be understood from within (Kivunja and Kuyini, 2017). This was done by using open ended questions to elicit responses (Kivunja and Kuyini, 2017) that examined the knowledge, attitudes and perceptions (KAP) of irrigation farmers on the contribution of social-capital.

A case study research design, ideal for this study was adopted and enabled in-depth interaction and understanding of Rozva Irrigation scheme social-capital dimensions. The Raosoft calculator was used to determine the sample size, which came out to be 91 individuals out of the 117 individuals in the research population. The irrigation scheme's blocks and committees were utilized to divide the sample size into quotas, which were then used to choose the respondents using the quota sampling approach. Semi-structured surveys, semi-structured interviews, focus groups, and document analysis were all used to gather data. Key

narrative responses elicited from farmers were transcribed under research question and key emergent and topical issues grouped together to give meanings to the text. Depending on these emergent and topical issues was relevant in that is addressed the felt issues dominating the findings.

5. Results and Discussion

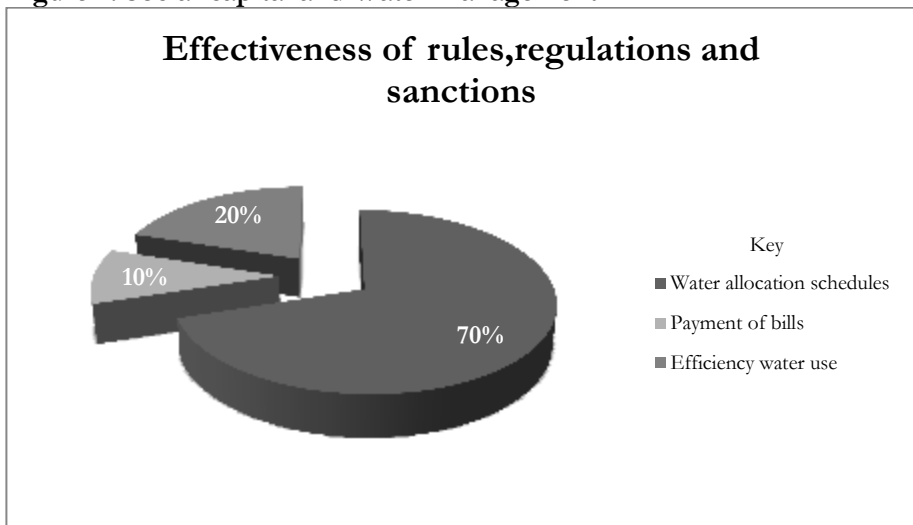
5.1 Nexus between Social-capital and Sustainability in Rozva Irrigation Scheme

As responders below have pointed out, social capital can support the Rozva irrigation scheme's sustainability in a number of ways. The findings are broken down into several themes and discussed below.

5.1.1 Water Management

The governance of smallholder irrigation projects in rural regions is contingent upon the implementation of efficient water management systems. Figure 2 below illustrates the impact of water management and social capital.

Figure 2: Social-capital and Water Management



Source: Field data (2019)

The Figure 2 above shows that 70% of the respondents indicated that the irrigation scheme's constitution rules, regulations and effective sanctions are very instrumental in ensuring that people abide by their watering allocations while 20% of the respondents indicated that these institutional frameworks also enable efficient use of water. Additionally, 10% of the respondents also indicated that rules, regulations and sanctions enhance timely payment of water bills. These results imply that rules, regulations and sanctions enhance water management and regulate water allocation schedules through a number of ways.

These results were magnified by a respondent during the focus group discussions who indicated that, '*people abide by the stated rules and regulations with regard to the use of water as this is a critical resource in the sustainability of this irrigation scheme*' (Focus group discussion, 13 June 2019). This result dovetails Scoones (2019)'s view that a conserved natural resource base is an essential outcome of a sustainable livelihoods. Therefore, the narratives above imply that effective water conservation administration plays a critical role in enhancing the sustainability of irrigated crop farming.

Paradoxically, interview results indicated that some farmers were not abiding by rules, and in some cases, they were found watering during allocated time slotted for other farmers who were also members of the irrigation scheme. Defiance of rules and regulations governing water allocation schedules created conflicts in the Rozva Irrigation scheme. This result confirms arguments by Mutambara et al. (2016) who found that excessive water-use triggers appropriation problems linked to water distribution among users with respect to water rights. Nevertheless, the results indicates that social-capital, through rules; regulations and effective sanctions administratively contribute to sustainability of irrigation schemes by improving water management. Thus, effective water management among irrigation schemes is a key determinant of sustainability among irrigations schemes (Wilchens, 2012). The discussion above highlights how social-capital contributes to the sustainability of smallholder irrigation-farming through enhancing water management systems. The views on the rehabilitation and maintenance of irrigation infrastructure are discussed below.

5.2.2 Rehabilitation and Maintenance of Irrigation Infrastructure

The rehabilitation and maintenance of irrigation infrastructure in smallholder irrigation schemes is an important aspect in the overall

management of smallholder irrigation crop farming business in rural areas of Zimbabwe. Table 2 below presents results from the field work.

Table 2: Rehabilitation and maintenance of irrigation infrastructure

Variable	Percentage of respondents
Collective action and cooperation	60
Partnerships with NGOs (linking social-capital)	40
Total	100

Source: Field data (2019)

Results in Table 2 above indicate that 60% of the respondents indicated that collective action and cooperation of irrigation farmers was an important ingredient in the rehabilitation and maintenance of the Rozva irrigation scheme infrastructure. Additionally, 40% of the respondents were of the view that partnership with NGOs through linking social-capital also helped to enhance the maintenance and rehabilitation of irrigation infrastructure. Similarly, during a focus group discussions one respondent noted that, *'the irrigation fence is regularly maintained by all farmers when need arise and we also collectively contribute money to repair pipes and hydrants'* (Focus Group Discussion, 13 June 2019).

The role of development partners was revealed by interview results which indicated that the Food and Agriculture Organization (FAO) played an important role in the maintenance and rehabilitation of the irrigation infrastructure. For instance, one interview respondent highlighted that, *'FAO has rehabilitated our water pipelines, inlet suction unit, engine and the night storage dam at the irrigation scheme which enhances its sustainability'* (Interview, 10 June 2019). This view implies that rehabilitation and maintenance of irrigation infrastructure is vital in ensuring the sustainability of irrigation schemes (Mutambara, Darkoh and Athlopheng, 2016). In support of this view, Mwendera *et al.* (2013) emphasised the maintenance of irrigation infrastructure as one of the critical factors determining long term performance and sustainability of smallholder irrigation schemes.

Partnership with development partners, collective action, cooperation and linking social-capital were found to be important attributes of social-capital which are crucial in enhancing the sustainability of Rozva Irrigation scheme through rehabilitation and maintenance of irrigation infrastructure. The discussion above therefore implies that social-capital significantly contributes to the sustainability of smallholder irrigation-farming as it helps to enhance continuity of crop farming activities through the rehabilitation and maintenance of

irrigation infrastructure. The importance of crop security in the smallholder irrigation scheme is also presented in Table 3 below.

5.2.3 Crop Security

The importance of crop security in the smallholder irrigation scheme cannot be over emphasised as food security hinges on the production of adequate food for the commercial purposes in the country.

Table 3: Social-capital and crop security

Variable	Percentage of Respondents
Social relations	40
Rules, regulations and sanctions	60
Total	100

Source: Field data (2019)

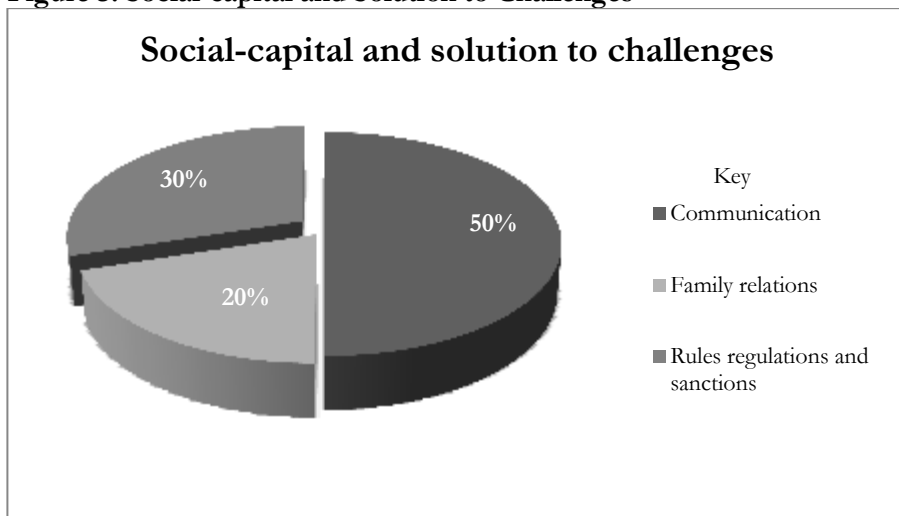
As can be seen from Table 3 above, 60% of respondents said that rules, regulations, and sanctions contributed to the irrigation scheme's increased crop security, while 40% said that social relationships were crucial to the irrigation scheme's increased crop security. Additionally, respondents in the focus group discussion highlighted that, '*.....we know each other very well and we can easily locate strangers who can potentially steal from the irrigation scheme*' (Focus group discussion, 11 June 2019). Results from the focus group discussions suggest that rules, regulations and effective sanctions are significant in enhancing crop security from animals and thieves. For instance, focus group discussion respondents indicated that rules addressing issues on proper gate security, use of designated entry points and individual responsibilities on livestock were essential in increasing crop security within the irrigation scheme. Thus, social-capital attributes such as close social relations, rules, regulations and sanctions enabled the irrigation scheme to increase the security of crops.

The article suggests that social-capital enabled the irrigation scheme to cope with potential shocks and stresses like crop destruction by animals and theft. Coping with shocks and stresses is a critical outcome of a sustainable livelihood (Scoones, 1998). Therefore, the results imply that social relations as well as rules, regulations and sanctions are instrumental in sustaining smallholder irrigation-farming and enhancement of rural livelihoods since the improvement of crop security might imply increases food security in rural areas.

5.2.4 Solving of Challenges

An effective mechanism for dealing with challenges in the smallholder irrigation scheme is instrumental in enhancement of sustainability and the survival of the scheme. The role of social-capital in the management of challenges in the smallholder irrigation scheme is presented in Figure 3 below.

Figure 3: Social-capital and Solution to Challenges



Source: Field Data (2019)

Results in Figure 3 above show that 50% of the respondents indicated that communication is a vital mechanism for the resolution of challenges while 30% of the respondents indicated that rules, regulations and effective sanctions used by the irrigation scheme also facilitated the resolution of challenges at the irrigation scheme. Additionally, 20% of the respondents highlighted that family relations which exist among farmers make it easier to encourage each other to contribute towards problem resolution at the irrigation scheme. One respondent in a focus group discussion indicated that, *'I encouraged my family to contribute towards the clearance of ZESA bill which had resulted in the disconnection of electricity supply at the scheme'* (Focus Group Discussion, 11 June 2019). The results from interviews also indicated that the meetings conducted at the irrigation scheme facilitate effective communication among the farmers and the Irrigation Management Committee which is essential for solving the problems they encounter. These results are consistent with Putman

(2000)'s view that social-capital enhances the resolution of challenges through communication and cooperation.

These results therefore imply that social-capital in form of social relations; communication and rules, regulations and sanctions facilitate problem resolution which is important in the sustainability of smallholder irrigation schemes and enhancement of rural livelihoods. The role of social-capital in the maintenance of farm profitability is presented in Table 4 below.

5.2.5 Enhancement of Farm Profitability

The enhancement of food security through smallholder irrigation schemes is closely related to the maintenance of farm profitability and the sustainability of the smallholder irrigation scheme. The role of social-capital in the achievement of smallholder irrigation scheme profitability is presented in Table 4 below.

Table 4: Social-capital and farm profitability

Variable	Percentage of respondents
Social connections	15
Partnership with companies	50
Communication	10
Solidarity	25
Total	100

Source: Field data (2019)

Table 4 above indicates that 50% of the respondents' perceived partnerships with companies to be vital in enhancing farm profitability at the Rozva irrigation scheme. Solidarity was identified by 25% of the respondents as an important element in the achievement of farm profitability in the smallholder irrigation scheme. Additionally, 15 % of the respondents identified social connections as an important attribute of social-capital that results in the enhancement of farm profitability, while 10% of the respondents highlighted that communication enhances farm profitability. These results imply that solidarity, social connections and communication are important in the achievement of farm profitability and sustainability the smallholder Rozva irrigation scheme.

The article found that social-capital and social connections were viewed by smallholder irrigation farmers at the Rozva irrigation scheme as vital for enhancing farm profitability through establishing contract farming arrangements with retailers located in urban centres. During a

focus group discussion, one respondent for instance, indicated that, *'the companies like Klein Karoo and Cairns Foods would require about 35 hectares of beans and peas which will be directly sold to the companies after harvesting and we have managed to make profits from these crops as these companies provided all inputs and offered much better prices than their usual selling prices at local markets like Nyika'* (Focus Group Discussion, 11 June 2022). That way, social-capital enabled smallholder irrigation farmers to connect and partner with the major companies such as Klein Karoo and Cairns Foods for huge production of beans and peas from the Rozva irrigation scheme. Furthermore, focus group discussions results revealed that social connections like family and friendship enabled farmers to collectively hire a truck to transport their farm produce to market places like Masvingo, Nyika and Zaka.

Additionally, respondents indicated that partnership and contract farming arrangements helped the smallholder irrigation scheme to reduce transportation costs and hence helped the irrigation scheme farmers to increase their profits margins. Interview results showed that solidarity among the farmers helps them agree on similar selling price for their horticultural goods produced by different farmers at the scheme. The article suggests that the agreement of the prices of farm produce ensures that every farmer in the irrigation scheme is able to make profit from the designated plots. Hence, the article argues that operating as a consortium of farmers and agreeing on price levels is important in sustaining the operation of the smallholder irrigation scheme. This finding is consistent with findings by Chazovachii (2016) who found that farm profitability is a determinant factor the achievement of sustainability in the smallholder irrigation schemes in rural Africa. It found that social-capital plays a significant role in smallholder irrigation schemes by helping farmers establish partnership agreements, cooperate and agree on price for farm produce, which props their farm profits. Views on the role of social-capital in the maintenance of social coherence among farmers participating in the smallholder irrigation scheme are presented in Table 5 below.

5.2.6 Social Coherence

The maintenance of social coherence among farmers in smallholder irrigation schemes is essential in cultivating collectivism and spirit of togetherness and unity of purpose.

Table 5: Social-capital and social coherence

Variable	Percentage of respondents
Shared norms	25
Shared values	35
Common language	40
Total	100

Source: Field data (2019)

Results in Table 5 above indicate that 40% of the respondents identified common language as essential in enabling social coherence among the irrigation farmers as it facilitated effective communication among members of the Rozva irrigation scheme. However, 35% of the respondents identified shared values as important in enhancing social coherence among irrigation farmers in the irrigation scheme while 25% of the respondents indicated that the shared norms are essential in enabling social coherence among the farmers. The article suggests that social-capital is instrumental in enhancing social coherence among the Rozva irrigation scheme farmers through shared values, shared norms and use of common language.

Focus group discussions respondents highlighted that shared norms such as *Tsika/Amasiko* (acceptable way of conduct) and *Unhu/Ubuntu* (humanity) are essential in regulating the conduct and behaviour of farmers in the Rozva irrigation scheme. Results from interviews also indicated that shared values which included religion and traditional values enhanced social coherence among irrigation farmers hence, allowed them to easily agree on days to work on their individual plots and days to rest.

One interview respondent from the Irrigation Management Committee pointed out that, '*social coherence enabled efficient water rationing and scheduling, high level of alignment between the operations of the scheme and the constitutions, timely payment of water bills, effective financial reporting and auditing, transparency, productivity, operation and maintenances and overall performance at the irrigation scheme*' (Interview, 9 June 2019). Social coherence is therefore a critical factor in enhancing sustainability small irrigation schemes in rural Africa. The views on the influence of social-capital in achieving effective governance in smallholder irrigation sector are presented in Table 6 below.

5.2.7 *Effective Governance*

The success of smallholder irrigation schemes in Africa, Asia and Latin America hinges on the implementation of an effective governance

system. Hence, the influence of social-capital on effective governance of the Rozva smallholder irrigation scheme is discussed below.

Table 6: Social-capital and Effective Governance

Variable	Percentage of Responses
Rules, regulations and effective sanctions	95
Not indicated	5
Total	100

Source: Field data (2019)

Table 6 above shows that 95% of the respondents indicated that the irrigation scheme's constitutional provisions such as rules, regulations and effective sanctions were very essential in the effective governance of the smallholder irrigation scheme. Surprisingly, 5% did not indicate their opinions in relation to social-capital and governance. However, the results in Table 6 is magnified by the assertion of an interview respondent from the Irrigation Management Committee who advanced that, *'rules, regulations and effective sanction enabled conflict resolution, overall management of irrigation infrastructure, water management as well as coordination of irrigation members on acceptable conduct, expectations and obligations'* (Interview, 8 June 2019). These results imply that social-capital in the form of rules, regulations and effective sanctions enhance effective governance and administration of Rozva irrigation scheme. This was found consistent with findings by Wilchens (2012) who suggested that effective governance is a key sustainability indicator in smallholder irrigation scheme, a view supported by Chai and Zeng (2018) in that social-capital enhances robust and adaptive irrigation scheme governance. In view of the above narratives, the article suggests that social-capital is vital in the sustainability of smallholder irrigation schemes as it enhances effective governance and management of smallholder irrigation schemes.

6. Conclusions and Policy Recommendations

The article argues that social-capital has been instrumental in the achievement of sustainability of the smallholder irrigation scheme through effective water management, rehabilitation and maintenance of irrigation infrastructure, social cohesion, government efficacy and challenges resolution. The article suggests that social-capital is vital in the sustainability of smallholder irrigation schemes as it enhances effective governance and management of smallholder irrigation schemes.

The article concludes that social-capital is an essential resource that when fully utilised enables rural livelihood adaptation and resilience to stresses and shocks such as crop damage, water related problems, power cuts and market failures by irrigation farmers. It concludes that the full utilisation of social-capital is a potentially vital resource smallholder irrigation farmers can and should exploit to be sustainable, increase profits and reduce poverty. It further concludes the success and sustainability of smallholder irrigation farmers hinges on developing comprehensive network linkages with other farmers from smallholder irrigation schemes and support organisations specialising in training and education on smallholder irrigation-farming.

The article suggests utilisation of these comprehensive network linkages increases capacity to access new knowledge and information sharing, which is critical for productivity and sustainability. It suggests there is need for smallholder irrigation farmers to fully utilise the social-capital they have, and recommends forming farmers' credit schemes such as the Rotating Savings and Credit Schemes. Rotating savings and credit schemes can be vital for informal financing of the farmers' needs such as inputs, payment of bills and subscriptions and the maintenance of irrigation infrastructure. Social-capital can enable irrigation farmers to effectively complement financial capital and thus curb the financial challenges which the farmers encounter in their farming business.

The article recommends that development organisations, private sector and government institutions that work with farmers need to incorporate social-capital into their programming and project implementation processes towards the utilisation of social-capital. The utilisation of linking social-capital by smallholder irrigation farmers and targeted capacity development programmes on the effective management and governance of smallholder irrigation schemes has the potential to help the farmers to become more self-reliant, productive and less dependent on the external support. Furthermore, implementation of capacity development programmes by agricultural extension department and development partners can also enable smallholder irrigation farmers to develop the skills to cope with shocks and stresses associated with irrigation-farming business.

References

Araral, E. (2013). What makes socio-ecological systems robust? An institutional analysis of the 2,000-year-old Ifugao society. *Human*

- Ecology*, 41, 859-870. a Water, F. T. Food Secure Future: Critical Perspectives for Policy-Makers. 2015.
- Baylis, K., Gong, Y., & Wang, S. (2013). Bridging vs. Bonding Social Capital and the Management of Common Pool Resources (No. w19195). National Bureau of Economic Research.
- Chai, Y., & Zeng, Y. (2018). Social-capital, institutional change, and adaptive governance of the 50-year-old Wang hilltop pond irrigation system in Guangdong, China. *International Journal of the Commons*, 12(2).
- Chazovachii, B. (2016). Conditions characterizing the sustainability of smallholder irrigation schemes: The case of Bikita District Zimbabwe (Doctoral dissertation, University of the Free State (Qwaqwa Campus)). Available from: <http://hdl.handle.net/11660/5321>. [Accessed 28-02-19].
- Dube, K. (2016). Implications of rural irrigation schemes on household economy. A case of Lower Gweru Irrigation Scheme, Zimbabwe. *South African Journal of Agricultural Extension*, 44(1), 75-90.
- Field, J. (2016). *Social capital*. Routledge.
- Fincham, J. E. (2008). Response rates and responsiveness for surveys, standards, and the Journal. *American journal of pharmaceutical education*, 72(2).
- Fukuyama, F. (1995). *Trust: The Social Virtues and the Creation of Prosperity* (Free, New York).
- Google Maps (2019). Map of Bikita District. [Online] Available at <http://www/map-of-bikita/district>. [Accessed 2-08-19].
- Granovetter, M. (2018). Economic action and social structure: The problem of embeddedness. In *The sociology of economic life* (pp. 22-45). Routledge.
- Hanjra, M. A., & Williams, T. O. (2020). Global change and investments in smallholder irrigation for food and nutrition security in Sub-Saharan Africa. *The role of smallholder farms in food and nutrition security*, 99-131.
- He, R. W., Guo, S. L., Deng, X., & Zhou, K. (2022). Influence of social-capital on the livelihood strategies of farmers under China's rural revitalization strategy in poor mountain areas: A case study of the Liangshan Yi autonomous prefecture. *Journal of Mountain Science*, 19(4), 958-973.
- Hunecke, C., Engler, A., Jara-Rojas, R., & Poortvliet, P. M. (2017). Understanding the role of social capital in adoption decisions: An application to irrigation technology. *Agricultural systems*, 153, 221-231.

- Inthakesone, B., & Syphoxay, P. (2021). Public investment on irrigation and poverty alleviation in rural Laos. *Journal of Risk and Financial Management*, 14(8), 352.
- Kirori, G. N. (2015). Social-capital as a strategy for promoting rural livelihoods: case for Kenya.
- Jacobs, C., Chitima, M., Bwanali, K., & van't Klooster, C. E. (2013). Determinants of the Productivity and Sustainability of irrigation schemes in Zimbabwe & Pre-investment Framework. World Bank.
- Jacques, D. C., Marinho, E., d'Andrimont, R., Waldner, F., Radoux, J., Gaspart, F., & Defourny, P. (2018). Social-capital and transaction costs in millet markets. *Heliyon*, 4(1).
- Kivunja, C., & Kuyini, A. B. (2017). Understanding and applying research paradigms in educational contexts. *International Journal of higher education*, 6(5), 26-41.
- Levidow, L., Zaccaria, D., Maia, R., Vivas, E., Todorovic, M., & Scardigno, A. (2014). Improving water-efficient irrigation: Prospects and difficulties of innovative practices. *Agricultural Water Management*, 146, 84-94.
- Lefore, N., Giordano, M. A., Ringler, C., & Barron, J. (2019). Sustainable and equitable growth in farmer-led irrigation in Sub-Saharan Africa: what will it take? *Water Alternatives*.
- McCartney, M. P., Whiting, L., Makin, I., Lankford, B. A., & Ringler, C. (2019). Rethinking irrigation modernisation: realising multiple objectives through the integration of fisheries. *Marine and Freshwater Research*, 70(9), 1201-1210.
- Mhembwe, S., Chiunya, N., & Dube, E. (2019). The contribution of small-scale rural irrigation schemes towards food security of smallholder farmers in Zimbabwe. *Jàmbá: Journal of Disaster Risk Studies*, 11(1), 1-11.
- Miao, S., Heijman, W., Zhu, X., & Lu, Q. (2015). Social-capital influences farmer participation in collective irrigation management in Shaanxi Province, China. *China Agricultural Economic Review*, 7(3), 448-466.
- Moyo, M., Van Rooyen, A., Moyo, M., Chivenge, P., & Bjornlund, H. (2017). Irrigation development in Zimbabwe: Understanding productivity barriers and opportunities at Mkoba and Silalatshani irrigation schemes. *International Journal of Water Resources Development*, 33(5), 740-754.
- Mujere, N., Chazovachii, B., Chifodya, G., & Mushuku, A. (2011). Evaluating factors influencing the variation of irrigated wheat yields.

- A case study of Chinyamatumwa irrigation scheme in Zimbabwe. *Journal of Sustainable Development in Africa*, 13(4), 177-188.
- Mupaso, N., Makombe, G., & Mugandani, R. (2023). Smallholder irrigation and poverty reduction in developing countries: a review. Heliyon.
- Mutambara, S., Darkoh, M. B., & Athlopheng, J. R. (2016). A comparative review of water management sustainability challenges in smallholder irrigation schemes in Africa and Asia. *Agricultural Water Management*, 171, 63-72.
- Mutiro, J., & Lautze, J. (2015). Irrigation in southern Africa: Success or failure?. *Irrigation and Drainage*, 64(2), 180-192.
- Mapuranga, D., & Muzerengi, T. (2017). Impact of small scale irrigation schemes in addressing food shortages in semi-arid areas: A case of Ingwizi irrigation Scheme in Mangwe District, Zimbabwe. *The International Journal of Humanities & Social Studies*, 5(7), 5-6.
- Mwendera, E., Chilonda, P., & Chigura, P. (2013). Options for operation and maintenance partnerships-A case study of Rupike irrigation scheme, Zimbabwe. *Sustainable Agriculture Research*, 2(526-2016-37771).
- Naithani, S., & Saha, A. K. (2021). Social-capital and livelihood strategies in response after 2013 Kedarnath disaster (India). *Disaster Prevention and Management: An International Journal*, 30(2), 179-193.
- Narayan, D., & Pritchett, L. (1999). Cents and sociability: Household income and social-capital in rural Tanzania. *Economic development and cultural change*, 47(4), 871-897.
- Nguyen, T., & Nguyen, C. (2016). Impact Evaluation of Irrigation on Rural Household Welfare: Evidence from Vietnam.
- Nhundu, K. (2013). Effectiveness of Irrigation Water Management Institutions in Zimbabwe (Doctoral dissertation, University of Fort Hare).
- Nonvide, G. M. A. (2019). A re-examination of the impact of irrigation on rice production in Benin: An application of the endogenous switching model. *Kasetsart Journal of Social Sciences*, 40(3), 657-662.
- Nonvide, G. M. A. (2018). Irrigation adoption: A potential avenue for reducing food insecurity among rice farmers in Benin. *Water resources and economics*, 24, 40-52.
- Ostrom, E. (1991). Crafting institutions for self-governing irrigation systems.
- Pokhriyal, N., & Jacques, D. C. (2017). Combining disparate data sources for improved poverty prediction and mapping. *Proceedings of the National Academy of Sciences*, 114(46), E9783-E9792.

- Platteau, J. P. (1994). Behind the market stage where real societies exist-part I: The role of public and private order institutions. *The Journal of Development Studies*, 30(3), 533-577.
- Putnam, R. D. (2000). *Bowling alone: The collapse and revival of American community*. Simon and Schuster.
- Rogošić, S., & Baranović, B. (2016). Social capital and educational achievements: Coleman vs. Bourdieu. *Center for Educational Policy Studies Journal*, 6(2), 81-100.
- Rukuni, M. (1988). The evolution of smallholder irrigation policy in Zimbabwe: 1928–1986. *Irrigation and Drainage Systems*, 2, 199-210.
- Scoones, I. (2016). The politics of sustainability and development. *Annual Review of Environment and Resources*, 41, 293-319.
- Scoones, I. (1998). Sustainable rural livelihoods: a framework for analysis.
- Scoones, I., Murimbarimba, F., & Mahenchene, J. (2019). Irrigating Zimbabwe after land reform: The potential of farmer-led systems. *Water Alternatives*, 12(1), 88-106.
- SeedCo (2019). *Natural Regions*. [online] Available from: www.seedcogroup.com/zw/farmer-hub/maize/region-2b [Accessed 13-02-19].
- Skutsch, J., Evans, D., & Brabben, T. (1999). Realizing the value of irrigation system maintenance.
- Smith, L. E. (2004). Assessment of the contribution of irrigation to poverty reduction and sustainable livelihoods. *International journal of water resources development*, 20(2), 243-257.
- Sorensen, C. (2000). Social-capital and rural development: a discussion of issues. World Bank. Social Development Family, Environmentally and Socially Sustainable Development Network.
- Sorensen, C. (1998). Social-capital Initiative. World Bank: Washington DC.
- Sun, H., Hartarska, V., Zhang, L., & Nadolnyak, D. (2018). The influence of social-capital on farm household's borrowing behavior in Rural China. *Sustainability*, 10(12), 4361.
- Tapela, B. N. (2008). Livelihoods in the wake of agricultural commercialisation in South Africa's poverty nodes: insights from small-scale irrigation schemes in Limpopo Province. *Development Southern Africa*, 25(2), 181-198.
- Villamayor-Tomas, S. (2018). Disturbance features, coordination and cooperation: an institutional economics analysis of adaptations in the Spanish irrigation sector. *Journal of Institutional Economics*, 14(3), 501-526.

- Villamayor-Tomas, S. (2018). Disturbance features, coordination and cooperation: an institutional economics analysis of adaptations in the Spanish irrigation sector. *Journal of Institutional Economics*, 14(3), 501-526.
- Wang, Y., & Huan, M. (2023). The effects of socialized agricultural services on rural collective action in the irrigation commons: Evidence from China. *Agricultural Water Management*, 289, 108519.
- Wichelns, D., Ahmed, F., & Balasubramanya, S. (2012). Institutional Sustainability of Smallholder Water Systems for Productive Use.
- Yu, D.J., Qubbaj, M.R., Muneeppeerakul, R., Anderies, J.M. and Aggarwal, R.M., 2015. Effect of infrastructure design on commons dilemmas in social-ecological system dynamics. *Proceedings of the National Academy of Sciences*, 112(43), pp.13207-13212.
- Zawe, C., Madyiwa, S. and Matete, M., 2015. Trends and Outlook: Agricultural Water Management in southern Africa. Country report-Zimbabwe. [Project report submitted to United States Agency for International Development's (USAID's) Feed the Future Program]. [online] Available from: <https://wle.cgiar.org/trends-and-outlook-agricultural>. [Accessed 20-04-19].