EFFECTIVENESS OF IRRIGATION WATER MANAGEMENT INSTITUTIONS IN ZIMBABWE:

A NEW INSTITUTIONAL ECONOMICS THEORY APPROACH

BY

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DECLARATION

I, the undersigned, do hereby declare that, unless specifically indicated to the contrary in the text, this dissertation is the result of my original work with the exception of such quotations or references which have been attributed to their authors or sources and that I have not previously submitted it at any University for a degree.

Dated: **EIGHTH** Day of **APRIL** in the year of **2013**

…….. ……..

Kenneth Nhundu **Date**

DEDICATION

My special dedication goes out to special people in my life who have been role models in different capacities.

Firstly, to my parents, my mother, Gladys Nhundu and my late father, Ishmael Nyeve Nhundu. You have been there for me always and I want to thank God for granting you the WISDOM to see me through and realise my personal dreams. To my mother, “I love you always”, may the Lord bless you and to my dad, “Rest in Peace Dad”, you were taken at such a time when I really needed your guidance. It was God’s wish that you cease to exist on this earth, but in memories, you are always cherished.

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ABSTRACT

Water policymakers around the world currently face a challenging task of managing water resources that have deteriorated due to overuse or mismanagement and Zimbabwe is not spared in this challenge. The neo-classical economics approach is limited in its approach to water management and is increasingly being questioned on its ability to provide answers to the many economic problems and issues in low- as well as high-income countries. As such, there is scope for alternative, multi-dimensional approaches. The New Institutional Economics (NIE) tradition offers one such alternative and provides an exciting and challenging new paradigm. The NIE can provide an alternative and more holistic approach to agricultural water resources management.

Institutions do structure economic forces and play an important role in expanding human choice, a fundamental goal of economic development. However, when considering agricultural water management, formal institutions tend to overshadow the local informal ones, although the latter guide the day-to-day interactions on water use. A study was carried out to evaluate how the formal water management institutions and the informal institutional arrangements influence irrigation water management in Mashonaland East Province in Zimbabwe. The objective was to evaluate the effectiveness and institution-performance linkages of the irrigation water institutions, with more emphasis on the effectiveness of formal and informal institutions in dealing with efficient irrigation water management. The NIE emphasises the need to focus, alongside formal institutions, on social institutions such as cultural norms and

behavioural attitudes towards agricultural water resources. Therefore, this thesis presents the application of the NIE analytical framework to the problems of agricultural water resources management.

The descriptive results of the study revealed the importance of both the formal and informal institutions in managing water resources, in particular, water law provisions to promote private sector participation, influence of other policies on the water policy, capacity to administer water resources and impact of private sector participation on water administration burden. However, most of the variables were either non-existent or non-effective to assist in the management of water resources.

With regards to the role and significance of irrigation water management institutions in the management of water resources, the research found significant relationship between the formal- and informal institutions and their components. Notably was the significance relationship between the informal institutions and water law, policy and administration, with t-statistic values of 0.173, 0.314 and 0.279 respectively, which were all significant and positive at the 10% significance level. This suggests a clear relationship between the informal institutions and the formal institution, implying policy-makers cannot afford to ignore the informal institution when they are dealing with water management institutions.

The study concludes that the interplay mechanisms between the formal and informal water institutions such water law, policy administration as well as norms, ideas and

incentives do promote effective institutional interplay and may serve to overcome coordination problems of irrigation water management. Moreover, it is expected that institutional interplay will improve over time resulting in sustainable irrigation water management.

The study concludes that informal water management institutions work together with the formal water management arrangements and should not be simply overlooked. In addition, future water irrigation management objectives in Zimbabwe must prioritise irrigation water development and management institutions in communal, small-scale commercial, and resettlement areas, both new and old schemes.

Although markets were not under the scope of the study, they play a crucial role in poverty alleviation and rural livelihood improvement as they provide an arena in which agricultural produce is traded, and different services to the water sector are provided, and interactions with the wider economy, takes place. As such, there is need to open markets to new water users among communal, small-scale commercial and resettlement farmers and there is need for the government, private sector and non-governmental organisations to actively intervene and promote the engagement of new water users with markets.

The study therefore recommends that the formal and informal institutions should be amalgamated to bring forth a real integrated irrigation water resource management framework. Water management practitioners, governments and private sector should

not uncritically embrace the formal state-based institutions as a panacea for irrigation water management. The government, private sector, local water users and other stakeholders dialogue and agree on the basis, modality, policy and procedures for managing irrigation water resources.

Key words: New Institutional Economics (NIE); water management; formal institutions; informal institutions; farmers; users; resources; institutions; WUAs: norms; rules

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LIST OF ACRONYMS

ARDA:	Agricultural and Rural Development Authority
AREX:	Department of Agricultural Research and Extension
BSAC:	British South African Company
CC:	Catchment Councils
COPs:	Catchment Outline Plans
CPR:	Common Pool Resources
CSO:	Central Statistical Office
DAE:	Department of Agricultural Engineering
DFID:	Department of International Development
DoI:	Department of Irrigation
EC:	European Commission
EU:	European Union
FAO:	Food and Agricultural Organisation
FTLRP:	Fast Track Land Reform Programme
GMB:	Grain Marketing Board
GoZ:	Government of Zimbabwe
GTZ:	Gesellschaft für Technische Zusammenarbeit
IDA:	Institutional Decomposition Analysis
IFAD:	International Fund for Agricultural Development
IFRC:	International Federation of Red Cross
ILSCF:	Indigenous Large Scale Commercial Farming
IMC:	Irrigation Management Committee
IWRM:	Integrated Water Resources Management
JICA:	Japan International Cooperation Agency
LSCF:	Large Scale Commercial Farming
MAIM:	Ministry of Agriculture, Irrigation and Mechanisation
MWRD:	Ministry of Water Resources and Development
NEPAD:	New Partnership for Africa's Development
NERP:	National Economic Recovery Programme

NIE:	New Institutional Economics
NR:	Natural Region
OFDA:	Office of US Foreign Disaster Assistance
OLS:	Ordinary Least Squares
SCC:	Sub-Catchment Councils
SIDA:	Swedish International Development Cooperation
SPSS:	Statistical Package for Social Scientists
U.S:	United States
UNICEF:	United Nations Children's Fund
WASH:	Water Sanitation and Hygiene
WUAs:	Water Users Associations
ZAPF:	Zimbabwe Agricultural Policy Framework
ZINWA:	Zimbabwe National Water Authority

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CHAPTER 1 - INTRODUCTION

1.0 Introduction

Despite considerable advances in technology across the world, some scholars (Bratton, 1987; Namara *et al*., 2010) have argued that declining agricultural productivity among smallholder farmers in Africa remains a major bottleneck in the development of the continent. Unganai (1993) indicates that about 60% of the southern African region is semi-arid or arid and suffers from periodic droughts. In addition, World Bank (2003) notes that agricultural production is dominated by rain-fed agriculture and irrigation systems are limited. This is compounded by the scarcity and poor management of irrigation water resources.

Water scarcity in agriculture has large impacts on the population, especially in rural areas, where more than 60% of the population are engaged in agriculture which represents their main source of food and income (FAO, 2008). On the macroeconomic level, agricultural share of the GDP is about 37% and 75% of the export value is generated from the agricultural sector globally. To this effect, management of agricultural water particularly in rain-fed systems remains imperative for improved farm level yields because the bulk of the food comes from rain-fed agriculture (FAO, 2008; Namara *et al.,* 2010).

However, increasing water scarcity and poor accessibility may become a limiting factor not only for agricultural production and the welfare of rural population but also for the entire economy. Improving the management of water resources and an efficient use of water by all sectors, including agricultural production, are therefore important if the welfare and health of the population, particularly in rural areas, are to be maintained and improved (Nyong & Kanaroglou, 1999).

In light of the above, effective management of agricultural water requires continuous backup from policies and institutional frameworks. According to FAO (2008), a conducive policy framework is essential for increasing productivity in developing countries. Research has confirmed that lack of enabling policies and effective institutional frameworks are a major contributor towards poor management and utilisation of agricultural water in Sub-Saharan Africa (Nhira & Mapiki, 2005; Namara *et al*., 2010).

Managing water effectively is fundamental for human society. Yet, evidence of the problems of water management is found throughout history (Merrey *et al.,* 2007). Over the past 50 years, a series of institutional arrangements have been presented as panaceas to improve water management: strong government agencies, user organizations, and water markets. Seemingly successful cases of state, user, or market governance of water were compared with problematic performances in other cases governed by other institutions, with the implication that if the institutions from the successful cases, whether a strong bureaucracy, a water users' association (WUA), or transferable water rights, were only replicated, they would solve the problems. Each of

these approaches has failed to live up to expectations, largely because the variability of local situations and the difficulty of transplanting institutions from one context to another were not taken into account (Merrey *et al.,* 2007), in particular, the irrigation water management institutions, yet irrigation reduces the risks and uncertainties associated with agriculture.

Irrigation is a vital component of agricultural production in almost all developed and developing countries. Therefore, in most cases agriculture becomes the major consumer of water among its other uses. This intense water use, in conjunction with its inherent low efficiency, is considered to be a significant burden in agricultural water management, while at the same time restrains a proper allocation of all water resources (Latinopoulos, 2005). Careful management of scarce water resources is essential to achieving global food security (Tiwari & Dinar, 2002; World Bank, 2003, Faures *et al*., 2002; Rosegrant & Cai, 2002).

However, water allocation is indeed a complex, hence, difficult task, especially when decisions on meeting all types of water demand have to be reached under various socio-economic objectives, like economic efficiency, sustainability and equity. Greece is a typical example of a country in which the current water allocation policy highly favours the agricultural sector, thus causing negative impacts on the national water resources sustainability (Latinopoulos, 2005). The management of irrigation water in developing countries in Asia, Africa and Latin America has become a critical issue for policy makers in recent decades due to increasing scarcity of water (Lam, 2001; Gulati & Narayananan, 2002). For nearly half a century, governments have invested heavily on

large irrigation infrastructure often supported by donor agencies such as the Asian Development Bank and the World Bank. However, governments also undertook the responsibilities for the management of irrigation water supplies. Government intervention in irrigation water management resulted in increasing government subsidies and higher levels of government regulation and control. The cost to the farmers of this heavily subsidized canal water is extremely low, varying between 5 percent and 15 percent of the canals' operating costs.

This has led to the creation of perverse incentives for farmers, bureaucrats and politicians to engage in rent-seeking activities (Lam, 2001; Gulati & Narayananan, 2002). The lower than expected returns have also been attributed to the inability to price irrigation water at their opportunity costs (Rosegrant *et al*, 1995). Wrong pricing policies for irrigation water have been implicated for the major deficiencies of irrigation systems throughout the developing world. A flat fee is levied, implying a zero marginal cost for water. Moreover, it is very rare to find the use of marginal cost pricing for irrigation in any country. The departures from marginal cost pricing do not seem to follow any regular principles and often *ad hoc* charges are used.

Mainstream economists champion greater adoption of market approaches, which use the price system to overcome the complexities of irrigation water management. However, available evidence confirms that market approaches alone cannot guarantee a satisfactory outcome to irrigation water management problems because of common property characteristics of water (Vandenberg, 2002; Lam, 2001; Saleth & Dinar, 2004). The design of incentives that will ensure that full social and economic costs of irrigation

water are covered is challenging. Furthermore, market-based policies are unlikely to achieve efficient use of water unless they are linked to institutions capable of implementing, monitoring and enforcing pricing policies at the local and national levels.

Scholars have argued that institutions are very important to improve irrigation water management problems (Ostrom, 1990; Ostrom & Gardner, 1993). However, neoclassical economics provided very little insight in understanding institutional conditions in developing countries and how a wide diversity of institutional arrangements can be used to achieve improved water allocation in different settings. How to incorporate and sustain institutional innovations to ensure efficient use and management of irrigation water under diverse ecological, economic, social, and political constraints is an on-going debate on irrigation water resource development (Saleth & Dinar, 2004).

Efficient use and management of irrigation water require changes in institutions and new institutions. To achieve this, a clearer understanding of the dynamics of institutional change including the dynamics between individual choice, institutional design, and the incentives embedded in the institutional environment is essential (Lam, 2001). Therefore, this study seeks to use the New Institutional Approach to evaluate the effectiveness of irrigation water management institutions.

The New Institutional Economics paradigm (NIE) provides a flexible framework to understand a wide network of institutions that influence economic behaviour and performance (Williamson, 1985; North, 1990). Unlike neoclassical economics, NIE

provides a finer theoretical focus by which to analyse the structure of transactions and their governing institutions. NIE recognises that the allocation of rights and responsibilities of transactions depend on the nature of the transaction, costs of monitoring and enforcement, the bargaining position and the relationship between the trading parties.

The NIE paradigm is an interdisciplinary research programme that deals explicitly with the link between institutions, institutional change and economic performance (Alston *et al,* 1996). It is a line of investigation that departs from, but does not abandon neo-classical economics. Central to the research agenda is an emphasis on property rights, the transaction costs of measurement and enforcement and incomplete information. Furthermore, NIE has been further enriched through cross-fertilisation with law, political science, sociology, anthropology and history (Alston *et al,* 1996).

NIE can play a crucial role in the context of developing economies where legal rights could be murky and information asymmetry would be widespread. As such, this study seeks to attempt to adopt this conceptual framework in its efforts to evaluate the effectiveness of institutions involved in irrigation water management in Zimbabwe.

1.1 Background to the study

An estimated 70% of the Zimbabweans live in impoverished rural areas (CSO, 2002), and dependent by and large on smallholder agriculture for their livelihoods. It follows that improvements in this sub-sector can lift a significant proportion of the country's

population out of poverty. In this regard, the “fast track” land reform programme (in which the majority of white-owned commercial farmland was acquired for resettlement) that the Government embarked upon in 2000, potentially provided an important means with which to address the worsening poverty.

By August 2003 slightly over 130 000-farming households were resettled (Utete, 2003) adding to the existing 1 000 000 and 60 000 households in the communal and old resettlement areas respectively (Muir, 1994). However, these figures are not indications of a success story as increasing food insecurity remains a poignant illustration of the worsening poverty.

Access to land alone, without extending it to water in semi-arid environments does not bode well for an informed analysis of the agrarian question in general or an understanding of how sustainable smallholder agricultural production can be structured (Cleaver, 1995). Ideally both land and water accessibility should be addressed simultaneously as these two resources complement each other in agricultural production (Manzungu, 2001). In this regard appropriate land and water legal arrangements are important (since all human interactions are mediated through one form of legal framework or another) especially to protect the interests of the less powerful members of the society, such as smallholder farmers.

In light of the above, a quick caveat needs to be added. Successful agricultural production also depends on other factors such as access to agricultural markets, affordable finance, appropriate technologies, adequate transport network, to mention

but a few. Moreover, productive water use by smallholder farmers in Zimbabwe cannot be achieved by merely changing the water legislation (IFAD, 1997). This has been illustrated by the fact that changes in water legislation in the post-colonial era failed to elicit the much-needed increase in productive water use in the smallholder sector. A case in point is the 10% of water in government dams reserved for smallholder farmers, which has remained unutilised.

Further to that, Utete (2003) acknowledges that Zimbabwe has taken steps to water reforms, majors challenges still remain as outlined below:

- Regularising water use;
- Inculcating a culture of paying for commercial use of water;
- Ensuring that (part of) the water revenue is invested in water development;
- Prioritisation of the development of water/irrigation projects according to well defined criteria;
- Strengthening new water institutions by ensuring that they are adequately funded; and
- Strengthening the statutory aspects of water resource management, which include planning of the country's water resources, undertaking collection and analysis of hydrological data, and water quality monitoring.

The challenges, according to Utete (2003), which have increased particularly in the aftermath of the land redistribution exercises, include:

- Ensuring that existing irrigation facilities are used efficiently and effectively;

- Carrying out a proper assessment of irrigation investments and projects for their financial sustainability, without ignoring social and political objectives;
- Streamlining institutions for cost effectiveness and efficient service delivery;
- Promotion of low cost irrigation and water harvesting technology to contribute to increased agricultural water productivity, as well as ensuring food security for the poor;
- Determining the respective roles of private and public sector irrigation;
- Establishing mechanisms to achieve equity as irrigation tends to benefit a privileged few;
- The Fast Track Land Reform Programme (FTLRP) has provided more development challenges to irrigation institutions, some of which are still in their infancy

Given the above challenges which have hampered plans to successfully engage in sustainable water reforms before and after the land reform exercises in Zimbabwe, Utete (2003) suggests some policy objectives and strategies to ensure sound water management results. Some of these issues as put forward by the Utete (2003) are outlined below:

- Establishing a water pricing structure consistent with cost and social efficiency
- Establishing an effective institutional structure
- Promotion of farmer-managed and operated systems
- Better coordination in implementation between public-public and public-private / NGO sector bodies, and

- Formation of effective, farmer-defined water users associations
- Issuance of water permits to water users where it applies
- Information dissemination campaigns where importance of regularising water use are undertaken
- Strengthening local water management where stakeholder and local people participation is promoted
- Co-opting new settlers in water management structures and processes to ensure their co-operation.

In summary it has been seen that the system of water allocation in the colonial period was based on the matrix of ideas of efficiency, modernity, white power, male supremacy and the conception of starving Africans of land and water (Campbell, 2003). Campbell (2003) further argues that the planning mechanism of the settler state was organised around the concept of the scarcity of water. Politicians, agricultural extension officers, water resource managers, hydrologists, engineers, planners and economists propagated the concept of water scarcity when in reality; the problem of water availability was one of democratic distribution and not availability. This was re-enforced by the myth of white supremacy, which was backed up in law and in the allocation of resources. Commercial agriculture was considered a part of the modern sector therefore commercial farmers.

1.2 Smallholder irrigation in Zimbabwe

Twenty years into independence the smallholder irrigation sub-sector in Zimbabwe was considered to be of little socio-political significance since its economic contribution was low. This was because of the fact that it accounted for a mere 10% of the country's irrigated area. This has, however, increased to about 26% since the fast track land reform programme incorporating the new model A1 and A2, and the communal and resettlement farmers (Utete, 2003).

Utete (2003) further highlights that the A1 resettlement model was designed and intended to decongest communal lands, therefore, consisted of smaller hectarages with room for beneficiaries establishing a new home. The A2 model was designed to create a cadre of black commercial farmers on the concept of full cost recovery from the beneficiary (therefore had bigger hectarages).

A number of evaluation studies have suggested that formal smallholder irrigation schemes (initiated and constructed by the government and these may be community or government managed) have poor performance and are not sustainable. Problems identified include poor water utilisation in terms of its timeliness and adequacy to the field and poor water application to the field (Pearce & Armstrong, 1990; Donkor, 1991; Makadho, 1993). Crop yields have been low and way below those achieved in the commercial farming sector.

The poor agricultural performance has translated into poor financial and economic viability, thereby necessitating heavy government subsidies, up to 75% in some cases. The problem, according to Rukuni (1993), is the inappropriate conventional budgeting technique, which ignores the sub-sector's unique history. Meinzen-Dick *et al* (1996) on the other hand, emphasises that agro-economic performance of smallholder irrigation schemes depends on a number of factors such as plot size, level of education of plot holders, access to markets and management structure.

The idea of modernising smallholder agriculture has characterised intervention in both the colonial and postcolonial era. This has resulted in a culture of evaluating smallholder irrigation on the basis of the technical efficiency of water delivery from the source to the field (and the crop). In addition, the focus on scientific observations as the standard for all agricultural practices has over-shadowed indigenous methods of water management in irrigation. Commercialisation was also one of the pillars of the modern drive. If sustainable smallholder irrigation is to be realized there is a need to reflect on what exactly modernization means and how it can be used to improve the livelihoods of the concerned people.

It would appear that the point of departure between the state and farmers seemed to have been the definition of 'commercial' farming or what constitutes it (Manzungu, 2003). The state relied on scientific models of cropping programmes, crop rotations etc., and equated what was considered to be scientific farming with commercial farming. However, the smallholder farmers had no fixed philosophical position but looked for practical solutions that could improve their livelihoods.

In this ‘game’, farmers do not consider themselves permanent commercial farmers (Manzungu, 2003). Depending on circumstances, they can be commercial farmers but also turn subsistence when the situation so demands. An informed analysis shows that this was about risk management. Issues of crop intensification based on market principles, where there is in reality no market, presented problems for farmers. Farmers were therefore reluctant to follow all the advice offered by state agencies precisely because of different perceptions they held about risk compared to that of the farmer.

The above discussion emphasises that one of the main reasons behind faltering smallholder irrigation was the neglect of indigenous water and irrigation management. State intervention tended to disenfranchise smallholder farmers because of the introduced legal systems. For example smallholder irrigators lost their rights over land, water and other resources. In addition, traditional water management practices have been realized to contribute to rural food security, but there has been a failure to acknowledge these practices by both the colonial and post-colonial state. This subsequently leads to the problem statement being formulated in the sub-section 1.3 below.

1.3 Statement of the Problem

One of the key problems of agricultural development in Zimbabwe is that most of the smallholder producers rely on rain-fed agriculture to make a living. Only one growing season per year is possible in Zimbabwe along with most of Southern Africa, compared

with two or three in parts of Asia (FAO, 2000). Given that most of the smallholder farmers are in drought prone areas of the country, it is clear that farm livelihoods are a high risk venture dependent on good rainfall seasons. This implies that availability of water for agricultural use is a major limiting factor even after the land reform programme. In light of this, it is imperative that agricultural water management becomes a key panacea in as much as irrigation farming is concerned. As such, it is relevant to study conditions under which institutions become effective in dealing with water management issues and this thesis attempts to address this phenomenon for better management of irrigation water systems.

However, in light of the above, the Government of Zimbabwe has continued the colonial practice of controlling all irrigated activities in the irrigation schemes. For example, farmers were required to follow set cropping programmes and irrigation schedules (Manzungu, 1999). In 1983 Irrigation Management Committees (IMCs) were introduced in smallholder irrigation in order to improve coordination between irrigators and water management. However, it is significant that these have not been able to take over management of the schemes, principally because the state applied a technical measure to their readiness, which underlined state distrust of local farmer institutions (Manzungu, 1999). In addition, there were also institutional problems where management was located in various ministries. This has resulted in duplication of efforts and in some cases, in lack of clarity on division of responsibilities thus creating problems of coordination. This presents a situation where the management of agricultural water resources is jeopardised.

Moreover, productive water use by smallholder farmers cannot be achieved by merely changing the water legislation (IFAD, 1997). In Zimbabwe, as noted by the same report, (IFAD, 1997), changes in water legislation in the post-colonial era failed to elicit the much-needed increase in productive water use in the smallholder sector. Supporting such an argument is Manzungu & Machiridza (2005), who posit that water laws are likely to succeed if they are underpinned by a sound economic ideology[1], referring to economic fundamental ideals/values that are popularised and translated into practice throughout society. A case in point is the 10% of water in government dams reserved for smallholder farmers, which has remained unutilised. As such, the research study seeks to evaluate the effectiveness of irrigation water management institutions and develop a sound platform for appropriate water-related policies for sustainable irrigation water management.

According to Gebremedhin *et al.* (2002), the solution to water management in most developing countries depends not only on appropriate technologies and efficient market prices, but also on local level institutions of resource management and organisations that enforce them. This implies that just establishing the institutional set-up for the resource management is not a sufficient condition for sustainable use of the resources. Effectiveness in internal governance is needed for the effective application of

[1] *Ideology incorporates legal, political, religious, artistic and philosophical values, all encapsulated in a 'set of norms'. It is referred to as a 'philosophy', 'spirit of the age', and a political programme ',' form of social consciousness' or a 'political theory' that legitimizes a particular type of social action*
Apart from political connotations, ideology also has economic connotations. This is because it is a product of economic relations of a given epoch that may continue to exist after these relations have become outmoded or replaced, and may exert a considerable influence on future social development (Taras, 1984: 4).
Seen in this light ideological difference are not necessarily about proving the validity of any one ideology per se, but about achieving a desired social effect with economic issues/interests playing a central role. Ideology performs a critical social function in that it makes it possible for society to better perform the necessary roles and functions. Without ideology, society lacks an influential regulatory mechanism and motivating force (Taras, 1984).

community rules. Therefore, the need to identify factors that facilitate or hinder the development and effectiveness of local formal and informal institutions and organisations becomes important.

The “fast track” land reform programme (in which the majority of white-owned commercial farmland was acquired for resettlement) that the Government embarked upon in 2000, potentially provided an important means with which to address the worsening poverty. However, the newly acquired irrigated areas of the “fast track” land reform programme, wherein their former white commercial farm owners were achieving good crop yields and reasonable water use, are facing sustainability challenges (Utete, 2003). This has been coupled with limited support in the form of inputs and markets. In addition, the fast track programme has also presented some challenges to irrigation institutions (Utete, 2003), some of which are still in their infancy. Some of the institutions mandated to oversee water resource development have found it difficult to cope. As such, this study seeks to find ways and conditions under which institutions should effectively function with regards to agricultural water.

Moreover, payment of water charges in Zimbabwe has been affected by the political climate. Most large-scale white commercial farmers, who previously paid for water, stopped paying when their farms were illegally invaded during the ‘fast track” land reform programme (Kujinga, 2002). Consequently, this has resulted in poor agricultural water management in Zimbabwe and the research study seeks to study how best effective institutions can be put in place and how best they can be capacitated to fully deliver on their mandates.

In addition, many governments have moved away from imposing the full costs upon the users of irrigation for political reasons because charges are resisted by farmers (Samad, 2005). The political consequences of reallocating water away from agriculture are too high. In South Asia, the cost of foregone agricultural production, multiplier effects regionally, and the resulting social problems of large pockets of poor rural residents are possible results that are politically unacceptable to governments and present little incentive to promote open water markets".

Similarly, in Zimbabwe, most of the smallholder irrigation farmers have refused to pay water levies arguing that water is a natural resource that comes from "God" and not from the government (Kujinga, 2002). They also argue that even if they pay, none of that money will be reinvested in their schemes which they have been managing themselves for years without government assistance. Machingambi & Manzungu (2002) carried out a study in the Save Catchment area and found that most water users in Zimbabwe consider water as a free good. Although the issue of making water users pay could be seen as legitimate, charging users for irrigation water services is a sensitive issue in many parts of the world. This usually involves political, historical, social, religious and economic dimensions. Water beneficiaries, especially farmers, tend to believe that low or zero charges are justified and this belief is usually reflected in their political system (Abu-Zeid, 2001). Though some irrigation farmers do not generally like to pay for water, there is a general belief that the purpose of making farmers pay is to ensure sustainability of services, water conservation, and mitigation of damages (Gorriz *et al.*, 1995). In light of this, the research seeks to evaluate the nature of the existing

water management institutions and how effective they are in ensuring effective water management through paying for water use.

Several studies on smallholder irrigation schemes in developing countries have observed that the smallholder schemes under-perform partly due to inadequate inputs and inaccessible markets (Makadho, 1994; Rukuni, 1994; Chancellor & Hide, 1997; FAO, 2000). In some cases, according to Tafesse (2003), government policies on land tenure and water allocation do not create a conducive environment for successful operation of smallholder irrigation schemes. Mpande (1984); Motsi *et al.* (2001) & Manzungu (1999) ascribed the failure of the smallholder schemes in Africa to substandard infrastructure, unclear irrigation scheduling and inefficient water use. Inefficient water use could be a result of poor, ineffective or absence of water management institutions. It is the goal of this research study to evaluate the existing water management institutions and their effectiveness to manage water resources efficiently.

Water is liquid, it is characterised as flowing, seeping, evaporating and transpiring. These attributes cause problems in identifying the source and measuring the resource and also result in interdependencies among water users (Young *et al,* 1986). Moreover, water supplies are often uncertain and variable. As a result of these attributes, the exclusive property rights which are the basis for an efficient exchange economy are difficult to establish and enforce. Relatively complex legal and administrative systems are needed in water allocation and it is believed that the research study will provide

meaningful insights on the formulation of water management systems that will ensure effective water management.

Above all, several studies have acknowledged the fact that informal local level institutions can make a difference in water management (Bruns & Meinzen-Dick, 2000; Bruns & Meinzen-Dick, 2003; Maganga, 2003; Mwakaje & Sokoni, 2003; Shah *et al*., 2001; Sokile *et al*., 2003; van Koppen, 2003). However, the majority of practitioners and decision-makers remain inclined towards supporting and propelling formal state-based water rights, water fees and WUAs, while closing their eyes to some local informal best practices. On the other hand, scholars supportive of informal arrangements are reluctant to push the case for practical local practices, choosing instead to combine (new) formal and (existing) informal arrangements. Hence, the risk is real that, even if local rights are recognized as legitimate by formal law, the way in which this is done i.e. privileging the formal will stifle the dynamics that are at the core of local arrangements and thus negatively affects local rights, hence poor irrigation water management. In light of this, the research study seeks to find answers to the following questions;

- Which institutions are involved in irrigation water management and what are their roles with respect to water management?
- Are existing irrigation water management institutions effective in managing irrigation water resources?
- Are irrigation water management institutions linked? If so, what is the nature of the relationship?

- What mechanisms should therefore be put in place for an effective and sustained agricultural water management framework
- What are the key policy implications that can be drawn to foster an effective agricultural water management framework in Zimbabwe?

1.4 Hypotheses and Objectives of the research study

The primary objective of the research study was to evaluate the effectiveness of irrigation water management institutions in managing irrigation water in Zimbabwe. Consequently, this will identify the potential in strengthening, capacitating and developing effective irrigation water management institutions for improved and sustained agricultural water management in Zimbabwe.

The working/general hypothesis is that irrigation water management institutions are existent in Zimbabwe and are effective in managing irrigation water resources efficiently. The general hypothesis is supported by the following specific hypotheses:

- Formal and informal irrigation water management institutions are effective in managing irrigation water resources in Zimbabwe
- There exists linkages between the formal and informal irrigation water institution in managing irrigation water resources

In light of the above tentative answers, the specific objectives of this study are therefore to:

- Assess the existing agricultural water institutions in managing agricultural water resources
- Evaluate the effectiveness of agricultural water management institutions in Zimbabwe.
- Assess the nature of linkages between the agricultural water management institutions
- Identify mechanisms to develop an effective and sustained agricultural water management framework

1.5 Justification of the research study

Although the post-2000 period presented complex social, economic and political challenges to water sector reform, there were inherent limitations embedded within the concept of integrated water resources management which lie at the heart of water sector reform in Zimbabwe (FAO, 2000). As such, this thesis attempts to find conditions aimed at re-engaging water reform policy with the objective of improving rural livelihoods in a post-crisis Zimbabwe, taking into cognisant the ‘old’ and ‘new’ issues that undermine improved access to, and management of, water for rural livelihood improvement.

Further to the above, efficient use and management of irrigation water require changes in water management institutions and new institutions. To achieve this, a clearer understanding of the dynamics of institutional change including the dynamics between individual choice, institutional design, and the incentives embedded in the institutional environment is essential (Lam, 2001).

Moreover, establishing appropriate irrigation water management institutions and strengthening capacity of water management organisations could help for efficient and equitable distribution of irrigation water for beneficiaries, thus contributing to increased productivity. Water management institutions are also important to avoid and manage conflicts and ensure the participation of women and the poor. In this regard, the findings of this study will contribute to narrowing the information gaps regarding the organisational and institutional context, management practices and collective action regarding irrigation water, and the major problems of irrigation development at the grass-root level. It will also shed some light on the problems of management and sustainability of agricultural water use in Zimbabwe.

Water management at the scheme and plot levels is a major factor influencing the success of smallholder irrigation schemes (Motsi *et al*., 2001; Samakande, 2002). Hence, this research study seeks to analyse the nature of the existing institutions and come up with best institutional practices for irrigation water management. Moreover, poor water management by farmers can lead to problems of land degradation and soil salinisation in smallholder irrigation schemes. In addition to that, inequitable water allocation was also identified as a cause of poor performance by some farmers (Pazvakavambwa & Van der Zaag, 2000).

Market approaches through proper pricing of water can efficiently allocate water resources, reduce drain on financial resources and limit government's role as suppliers of irrigation water. Demand side water saving can provide incentives for farmers to shift from water intensive crops to higher valued and less water intensive crops (Rosegrant

et al., 1995). Furthermore, market-based approaches are unlikely to achieve efficient use of water unless they are linked to institutions capable of implementing, monitoring and enforcing pricing policies at the local and national levels.

Gulati & Narayanan (2002) argue that better management of irrigation water can be achieved if the irrigation systems are distanced from political interference and de-bureaucratised. This ostensibly reduces the role of government, achieves higher returns to irrigation investment, ensure greater control, responsibility, greater equity and fairness in the distribution of benefits and can lead to poverty reduction. The WUAs reflect empowerment of farmers to make their own decisions in water allocation and management. In this light, the study seeks to find ways of limiting government role in irrigation water management and how best water users can be empowered to effectively manage irrigation water resources.

It is based on the above justification that the research study will attempt to come up with a best irrigation water management framework for an improved, efficient, effective and sustained agricultural water management in Zimbabwe.

1.6 Delineation and definitions of the study

The term 'Agricultural Water Management' as used in this study refers to management of all water put into irrigation agriculture (crops, etc.) and is used inter-changeably with irrigation water management. The study was carried out in one province of Zimbabwe, Mashonaland East Province. Basically, the study population included A1, A2 and

communal/resettlement farmers who have been in irrigation farming for at least five years and their irrigation systems were functional at the time of the interview. The farmers were not interviewed and analysed based on whether they were A1, A2, etc. because the study sought to evaluate the effectiveness of irrigation water institutions in managing water resources. The same institutions under the study are rules that apply universally to all the farmers, irrespective of the category in which they fall. The institutions included the “rules and regulations”, whether formal or informal institutions. Formal institutions were defined as the irrigation water law, irrigation water policy and irrigation water administration, while the informal included issues like norms, culture and social settings in a given context.

1.7 Organisation of the thesis

Chapter one presents the introduction of the study. It attempts to give a general overview of water management issues, in general and with specific reference to irrigation. In addition, the chapter also discusses the challenges of water management and some mechanisms of best water management practices. The background to the study, paying particular reference to Zimbabwe is also presented in Chapter 1. The problem statement, objectives, research questions and justification of the study are presented in this chapter.

Chapter two discusses the water sector reforms and management in Zimbabwe, paying particular attention to water management in the colonial era and after the post-independence era, highlighting critical changes to water management.

Chapter three presents the theoretical framework of the study. This chapter discusses the neo-classical theories, the old and new institutional economics approaches and the justification of adopting the new institutional approach in this study. A review of other theories, paying particular attention to irrigation water and how they are related to the study is also presented in this chapter.

Chapter four is a review of literature on other studies done by other scholars with the application of the new institutional economics as an analytical framework. This is important as it presents a ground for comparison with the research findings. In addition, a review of the analytical framework to be used is also discussed in this chapter.

Chapter five presents the description and major characteristics of the study area. It also presents the methodology of the study. The research design is also explained in this chapter.

Chapter six presents the descriptive inferences of the study.

Chapter seven presents and discusses the empirical analysis results, mainly focussing on the institution-performance relationships.

Lastly, **Chapter eight** discusses the conclusions and policy recommendations of the study. Areas for further research are also presented in this chapter.

CHAPTER 2 – WATER- SECTOR REFORMS AND MANAGEMENT IN ZIMBABWE

2.0 Introduction

Although water was perhaps more inequitably distributed than land, there was little organised political agitation around inequitable access by the various agricultural users. However, repeated droughts and a realisation that having access to surface water can make a difference meant that the late 1990s witnessed a dramatic transformation in water policy in Zimbabwe. Underlying this transformation was the adoption of the concept of 'integrated water resources management' (IWRM) within national policy framework. At the core of the integrated water resources management concept was an emphasis on the management of water on the basis of:

- Hydrological boundaries, namely the catchment and sub-catchment areas,
- Decentralization of water management,
- Stakeholder participation and representation in water management processes, and
- The treatment of water as an economic good.

In combination, these four principles were viewed as providing an effective framework for water management aimed not only at the participation of water users in processes and decision making on water, but also at poverty reduction and livelihood

improvement, particularly among previously disadvantaged water users, namely communal, resettlement and small-scale farmers.

2.1 Objectives of water reforms and management

The twin objectives of the water reform were tied to the four key IWRM principles discussed above. First, starting from the premise that water must be managed on the basis of hydrological boundaries since they constitute the 'natural' boundaries of a river system (Newson, 1997), the case for decentralisation was advanced. Catchment and sub-catchment areas became the bedrock upon which decentralized institutions of water management, catchment and sub-catchment councils were constructed.

Secondly, stemming from this, the case for decentralised institutional framework for water management was drawn from the theoretical appeal of decentralization which postulates that a more decentralized framework is more exposed, and therefore more responsive to local needs and aspirations (Crook & Sverisson, 2001). As such, decentralization was viewed as providing systems of water governance that are accountable to local people (Crook & Manor, 1998; Manor, 1999). In addition to this, it was suggested that decentralization of water management provides an institutional forum for promoting participation and representation of different water users in decision making processes.

Thirdly, by treating water as an economic good with a price attached to the resource, proponents argued that this would lead not only to the efficient use of water but also

generate revenue necessary for financing decentralized institutions of water management, and water resources development and management at a broader level.

However, despite that Zimbabwe's water reforms reflected the embedment of the concept and principles of integrated water resources management, this was at variance with local concerns and aspirations for water sector reform. According to Matinenga (1999); Manzungu *et al*. (1999) & Bolding *et al.* (1998), central to local concerns was the need to 'redress colonial injustices in the water sector' as some government officials were pointing out that 'continued privileged access to water by commercial interests, mainly large scale commercial agriculture, was no longer aligned to the political dispensation of an independent Zimbabwe.

In light of the above, it was therefore argued that there was an urgent need to reform the water sector, and establish a legal framework that ensured equal access to water for all Zimbabweans. Equitable access to water was viewed as providing a basis for rural people to gain access to water for productive uses which would contribute to the improvement of their livelihoods derived from the use of water.

The Water Act governs the use of water in Zimbabwe (Makurira & Mugumo, 2002). Two different processes drove the water sector reforms of 1994 in Zimbabwe (Pazvakavambwa, 2002), ahead of other sub-Saharan countries in Africa. The first factor was the general global concern pressing for a more efficient and sustainable approach to water management. The second factor was water legislation that was perceived to be inconsistent with present trends in Zimbabwe. More water users were

applying for water rights, yet the existing legislation was not sufficiently flexible to accommodate more players. This was evident in highly committed areas, where almost all available water had already been allocated and therefore new users could not be accommodated. For instance, the 1976 Water Act was intended to protect the interests of commercial farmers, despite that they only constituted less than 1 percent of the country's population of 13 million (Manzungu, 2002).

2.2 Water Resources in Zimbabwe: Hydrological and Historical Context

There exists great variation in the spatial distribution of water resources in Zimbabwe based on rainfall potential, and this has played a major role in determining how the country divides into six agro-ecological zones. It is onto this landscape of diverse variation in water resources and agricultural potential that deprivation of water to smallholder farmers not only created a skewed distribution of land, but also an inequitable access to water (Weinrich, 1975). Based on this land alienation and inequitable distribution of water, African irrigation schemes were developed with the view to promoting productive uses of water in selected 'native reserves' 'on small pockets of irrigable land partly with the objective to allow the resettlement of a larger population of people whose land had been 'alienated'' (Weinrich, 1975).

According to Kambudzi (1997); Mtisi & Nicol (2003), the colonial state, based on the dual division of land, established a legal and administrative framework that governed access to, and control of, water in favour of certain sectional interests, namely urban areas, commercial agriculture, mining and manufacturing industries. From the 1890s up

to 1927, water was governed by a set of loosely coordinated pieces of legislation which apportioned water to a nascent urban, mining, railway and agricultural sectors. Water for agriculture was apportioned and managed under the Water Ordinance of 1913, which was repealed by the 1927 Water Act, which was, in turn, repealed by the 1976 Water Act. To this end, the 1976 Water Act became the most comprehensive piece of water legislation that set the parameters of access, use and control of water from 1976 to 1997. Central to the water legislation was the denial of access to water for productive purposes to the majority of Africans.

2.2.1 Water legislation: The early years: 1890-1927

In the early years, the preoccupation with mining resulted in a situation where water was committed to mining, which later changed to agriculture. Varying concepts of water law were tried. For example in the allocation of water rights a frontier mentality was displayed with such claims as:

> *'… being a new country, Southern Rhodesia is unhampered by the pernicious common law relating to riparian ownership'. In this way the water rights of the indigenous population, which predated the settler claims were disregarded* (Manzungu & Senzanje, 1996).

Conflicts over water did not take long to develop. The frequent and often costly litigations between rival claimants to the use of water culminated in the Union Irrigation Act of 1912. This made provisions for the control, apportionment and use of water. The

Act was based on the common law as evolved and expounded by the Courts (McIlwain, 1936). In 1913, the Water Ordinance was passed as a way of comprehensively dealing with problems of rights to water (Mcllwain, 1936).

The South African connection had a strong influence on some aspects of water management. For example the settlers, encouraged by the British South Africa Company (BSAC) used the Roman Dutch Law that had been brought from Holland and then in use in South Africa. This was regarded as unsuited to the water resources and production of the region (McIlwain, 1936). There was, however, continued use of the riparian[2] rights doctrine in interpreting access rights and differentiated water use types. The 1920 Water Ordinance explained that:

[2] *Riparian water rights system is an arrangement where water is allocated among those who possess land about its source.*

General principle of the Riparian system

Under the riparian principle, all landowners whose property is adjoining to a body of water have the right to make reasonable use of it. If there is not enough water to satisfy all users, allotments are generally fixed in proportion to frontage on the water source. These rights cannot be sold or transferred other than with the adjoining land, and water cannot be transferred out of the watershed.

Riparian rights include such things as the right to access for swimming, boating and fishing; the right to wharf out to a point of navigability; the right to erect structures such as docks, piers, and boat lifts; the right to use the water for domestic purposes; the right to accretions caused by water level fluctuations. Riparian rights also depend upon "reasonable use" as it relates to other riparian owners to ensure that the rights of one riparian owner are weighed fairly and equitably with the rights of adjacent riparian owners.

'If a farmer has land well suited for irrigation and there is a stream that can be economically utilised, he can acquire the right to use the whole of the water for irrigation even though it may leave others without water except for primary purposes'.

The granting of responsible government in 1923, however, did not result in complete dissociation from the principles of the Roman Dutch Law. The riparian doctrine remained on the statutes until 1998 albeit with some modifications. What needs to be pointed out is that although there were disagreements between the settlers over which was the better legal ideology to guide water allocation, the situation was worse for indigenous people. Land appropriations disadvantaged them in that they were downstream of white settlers and were generally no longer riparian to perennial rivers; the whole legal system was against them and this was compounded by a shortage of the necessary finance for accessing water rights.

Another concept that was reflected in the water law was primary water use. This was water for human and farm livestock use and was set at 50 gallons (~228litres) per person per day. This was quite generous more-so because it could be used in and around the homestead, which did not preclude gardening. Water for 'secondary purposes' was for irrigation and watering of stock other than farm stock. 'Tertiary purposes' included the needs of the mines and railways. The water resources legal environment in the colony (Rhodesia) was marked by three major laws as discussed in the following sections.

2.2.2 Agriculture-based water law: 1927-1980

Table 2.1 below shows the main changes to the water legislation during the time agriculture became a dominant water user.

Table 2.1: Main characteristics of water legislation between 1927 and 1980

1927 Act	1947 Act	1976 Act
• Differentiation of public and private streams • Differentiation of primary, secondary and tertiary use • Created a Water Registrar and Water Court which centralized water allocation • Required [all] people [using water] to apply for both a water right and approval of works to a Water Registrar • Set up a 'priority right' system for a drought year with applications given priority in order of time • Allowed recognition of 'combined irrigation systems' with Irrigation Boards that had certain rights and responsibilities in payments of development capital • Required registration of all dams storing over one million gallons unless for a primary right	• Declared that all water other than private water was registered with the governor • Reconfirmed that water rights were attached to land and not individuals • Private water was defined as 'that which naturally rises, falls or drains on to any land, provided such water is not naturally capable of entering any water course of natural origin' • Defined primary use as use for humans and animals and was set at 50 gallons (~228 litres) per day per person resident irrespective of colour or race, which can be used in gardens, for waterborne sewage purposes or other activities • Clarified the rights of riparian landowners: 'They have the right, without any reference to the Water Court, to impound, divert or take any public water for primary use, and this right extends to any occupier or tenant of riparian lands. They also have, otherwise than in the public interest, a prior claim over non-riparian owners to be allocated by a Water Court for irrigation or other purposes' • Redefined priority of use as, firstly, all primary rights, then rights for irrigation purposes (based on date of issue) and then tertiary rights	• Clarified and created regulations about groundwater use for the first time. No restrictions were placed on drilling except in underground or surface water control areas. • Rights to use, and permits for groundwater, were linked to land • Required dams of a certain size to be registered, and design and construction to be carried out by a registered engineer • Required a riparian landowner intending to dam a public stream to notify all riparians downstream of the dam and contiguous to the dam • Rescheduled water use types so that irrigation, fish farming and feedlots were registered as agricultural use

Source[3]: Cited in Manzungu & Machiridza (2005)

[3] *Vincent & Manzungu (in press)*

By the Act of 1927, the priority right to water, granted to the mining industry within the Gold Belt areas, was modified in favour of irrigation (National Archives of Zimbabwe,). Therein were a number of clauses that disadvantaged the indigenous native population. First of all water rights were attached to land, which disadvantaged the natives who had been dispossessed and placed in the reserves where they did not enjoy full rights. Rights to land in the reserves were registered with Communal Area bodies (formerly known as Tribal Trust Lands) and not with individuals. Natives could therefore only apply for water rights as a community, and through government officials. Even then the District Administrator or Minister of Water Development held the water right on the behalf of the natives.

However, there was provision for the appointment of representatives of 'native interests' in the Irrigation Boards and in the Water Courts. Not much is known about whether or not they were actually represented. Settlers on the other hand could individually apply for water rights because they owned land in their own private capacity. Another problem was that water rights were issued based on the priority date system; this meant that rights were granted on a first-come first-served basis.

The Black indigenous people were disadvantaged because they had not applied for water rights (Manzungu, 2001). When they later understood this, most of the water was committed to rights held by the settlers. Water rights were also issued in perpetuity, which meant that a water right once issued could not be revoked except in special circumstances such as the declaration of a drought or when someone else applied for the same water

and was willing to pay compensation. By virtue of the fact that settlers applied for the rights way before the indigenes, most of the water was committed. It should be noted that although racial water allocation was provided for in the 1927 Water Act, it was only in the 1940s that massive transfers of water to the whites actually occurred because of cheap finance. This emphasizes the argument that it is not necessarily changes in water legislation that determines (lack of) access to water.

The 1947 Water Amendment Act had loose allowances for primary water uses especially for gardens and riparian users. The Act also defined vleis (*dambos* [seasonally flooded wetlands] or wetlands in depressions), springs and streams that stayed outside public management because they were defined as 'private water'. This changed later with restrictions on *dambo* cultivation mainly because of fear of degradation, which had been noticed in the white farms. The Act also identified new water uses such as fish farms and conservation activities that were a result of new commercial interests.

The Water Act of 1976 affirmed the Roman Dutch Law concept in water management and upheld the principles of the 1927 Water Act, that is, rights to water were linked to land, the priority date system of allocating water and granting a water right in perpetuity. The Act also provided for catchment outline plans to be prepared for the development and use of surface water. Three types of water were recognised, public water, private water and underground water. The Act, under a 1984 amendment, also provided for some stakeholder participation in such institutions as River Boards. The participation was, however, restricted to water right holders. The Act also required applicants for water rights

to put in place water measuring devices for a water right to be confirmed as permanent. This explains why most water rights in the native areas were temporary – the natives could not afford to put in the requisite measuring devices.

In addition, the Act set differential access to water based on the type of water one wants to gain access to, whether 'private water' or 'public water'. Access to 'private water' was vested in the owner of the land on which it was found and its sole and exclusive use belonged to such an owner[4]. The Act allowed the owners, lessees or occupiers of any land to construct wells and drill boreholes of which the amount of water abstracted was not controlled (Matinenga, 1999). On the other hand, access to 'public water' was vested in the state and its use, apart from primary purposes, required that a water right be granted to the user by the Water Court. Right of access to 'public water' was based on prior appropriation doctrine, which meant that access is based on the date on which an appropriation to the beneficial use of water was made. Simply put, earlier applicants had the first appropriation right of access to water.

Legal access to water and associated water rights were attached to land, and were granted in perpetuity. Thus, only individuals with title deeds to land could apply for, and be granted, water rights. This included groundwater, whereby rights to water were attached to the title deed of the land on which it was found. The granting of water rights under the 1976 Water Act took cognisance of the pre-existing rights to riparian owners, which meant that each riparian owner was entitled to claim all the water which he could have claimed

[4] Section 32 (1), Water Act No. 41 of 1976.

under the previous water laws. This ensured continued privileged access and rights to water for earlier applicants.

The main weaknesses of the Water Act of 1976:

- The issue of all water rights was centralized at the Water Court in Harare.
- A water right was issued in perpetuity on a first-come-first-served basis. This meant that when water resources were fully allocated, no further water rights would be issued, regardless of the need.
- In the event of water shortage, the process of reallocation was very long and complex.
- A water right would not be revised, even if the right holder was not exercising his or her water rights. The water rights could only be revised if the holder volunteered to do so.
- The process of acquiring a water right was very long. Once granted, there was no requirement to pay for the possession of the water right or to contribute towards general water service provision.
- The act was silent on water quality and factors relating to the environment.
- There was little consideration given to groundwater supplies. The Secretary of Water in the Ministry of Water Resources and Development had to be informed if a deep borehole was drilled, but there was no control on the amounts of groundwater pumped, or the number and spacing of such boreholes.

In general, the Water Act of 1976 was a good piece of legislation that brought any form of water use under control and aimed at the systematic allocation of water among users. According to the act, anyone was entitled to access to water, as long as the water was for primary use (basic human sustenance). Any use of water from which the user would derive a benefit was deemed commercial use, and required a water right. All water rights were issued in Harare by the Water Court, which was based at the Administrative Court of Zimbabwe.

The Water Act (1976) was amended several times, and global modern trends pushed for a review of existing approaches to water management in Zimbabwe. This led to the complete overhaul of the Water Act (1976), which was replaced with the Water Act (1998), conforming to global trends and addressing pressing national issues.

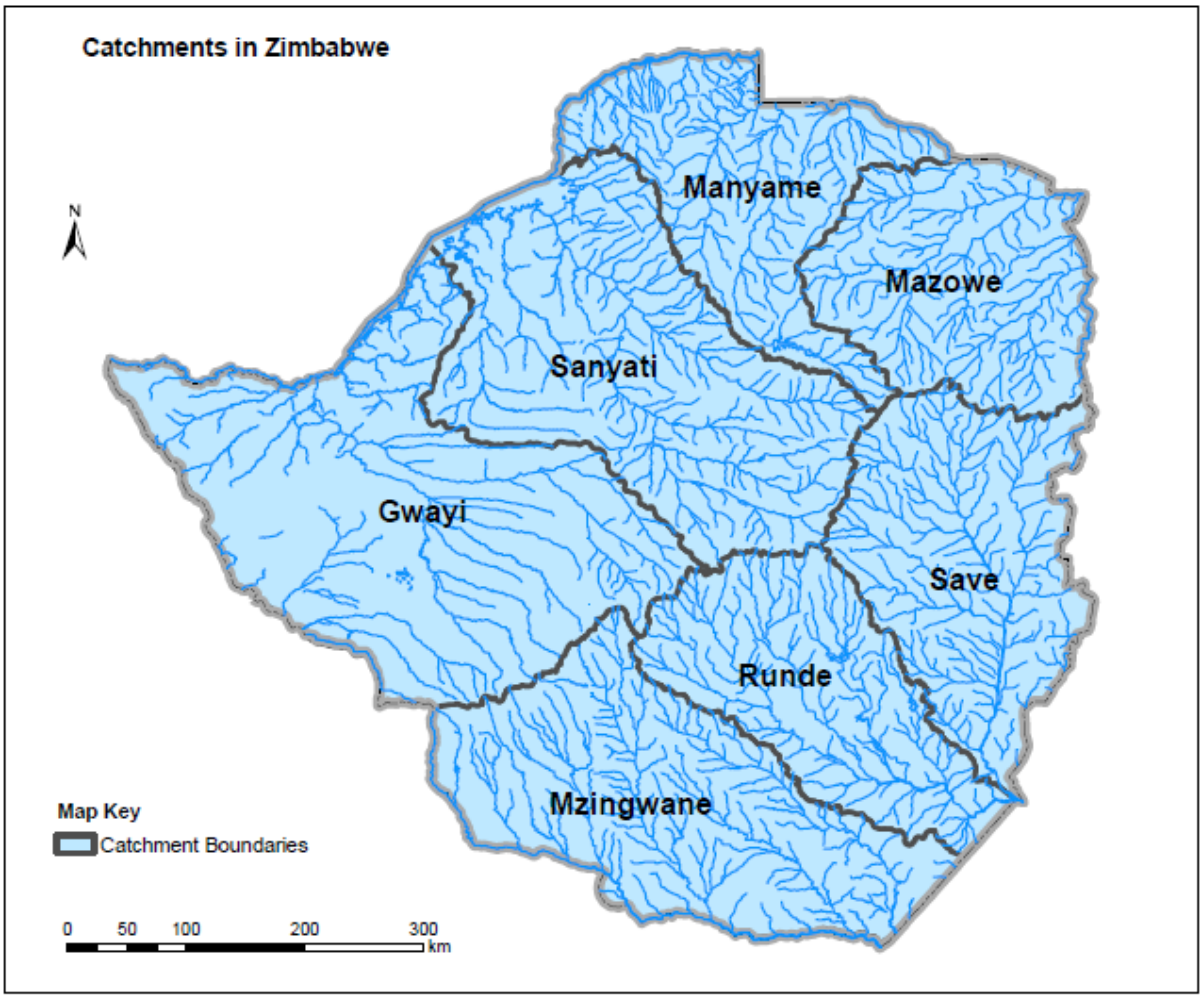
2.2.3 Redressing past water injustices

The lack of a clear ideology can also be traced to the water reforms. For close to two decades into independence water resource management continued to be governed by the 1976 Water Act. However, it has been established that the need for water reform emanated from two distinct concerns. One strand was partly rooted in the need to 'redress colonial injustices in the water sector' (Matinenga, 1999; Manzungu *et al.*, 1999, Bolding *et al.,* 1998). Continued privileged access to water by commercial interests especially white large scale commercial agriculture ensured that there was an urgent need to reform the water sector, and establish a legal framework that ensured equal access to water for all

Zimbabweans. Equitable access to water was viewed as providing a basis for rural people to gain access to water for productive uses which would contribute to the improvement of their livelihoods derived from the use of water.

Secondly, the water reforms that culminated in the 1998 Water Act also began as a knee jerk reaction to the 1991/92 drought, the worst in the country's history (Makarau, 1999).

Within this context, the 1976 Water Act was repealed by two pieces of water legislation, namely the Water Act and the Zimbabwe National Water Authority (ZINWA) Act, both promulgated in 1998. The Water Act of 1998 set the parameters of access and use of water as well as providing for the establishment of Catchment and Sub-catchment areas based on hydrological boundaries. Catchment and sub-catchment areas formed the basis for water management. In this vein, seven catchment areas were established in Zimbabwe and are shown in Figure 2.1 below.



Source: Chimhowu et al., (2009)

Figure 2.1: Catchments in Zimbabwe[5]

The creation of catchment and sub-catchment areas led to the introduction of Catchment and Sub-catchment councils respectively. Broadly, Catchment Councils (CCs) are composed of elected representatives, mainly chairpersons and vice-chairpersons, of sub-catchment councils. Catchment Councils also include the Catchment Manager, and any other identified stakeholders.

[5] Chimhowu *et al (2009)*

The key functions of CCs include, preparing catchment outline plans for their respective area, determining applications and granting water permits, regulating and supervising the use of water, and supervising the performance of functions of sub-catchment councils (Water Act, 1998). Further, CCs serve as a forum for participation and decision making for water users represented by elected sub-catchment council officials.

Below the CC, there are sub-catchment councils, which are constituted by elected representatives from diverse water user groups, which include commercial, communal, small-scale and resettlement farming sectors, local authorities, traditional leaders, and mining and manufacturing sectors. The main functions of a sub-catchment council include, inter alia;

- Regulating and supervising the exercise of permits for the use of water within their area of jurisdiction.
- Collecting sub-catchment rates, fees and levies.
- Reporting as required to the Catchment Council on exercise of water permits in their area, and
- Participating in the planning on water.

Sub-catchment councils also serve as a platform for local level participation in water management

2.2.4 The Water Act of 1998

The first step towards reviewing the 1976 Water Act was the setting up of an inter-ministerial review committee headed by the Ministry of Lands, Agriculture and Water Development in mid-1993. The committee recommended that a new Water Act be put in place. In the short-term, smallholder farmers were allocated 10% of all water in government dams. This was the origin of the 1998 Water and Zimbabwe National Water Authority Acts.

The new Water Act had the following provisions:

- Water permits, valid for a limited time sufficient to earn back money invested to develop facilities, were to be issued instead of water rights in perpetuity.
- Priority would be given to efficient irrigation systems
- The priority date system was replaced with proportional water allocation.
- The polluter pays principle was evoked where people who cause pollution of water pay for expenses for removing the pollution.
- The environment was regarded as a legitimate ‘user’ of water competing with other users such as industrial, agricultural, mining and domestic users.
- The state owned all surface and underground water. Except for primary purposes (mainly for domestic uses such as drinking, cooking and washing) any use of water would need approval by the state

- Water would be managed by catchment areas, as rivers do not match political or administrative boundaries. All people with an interest in the use of water would be involved in making decisions about its use and management. Identified groups included representatives from communal, small-scale commercial and large farms and mines, as well as urban representatives from industry, manufacturing and municipalities. These would replace the River Boards (which used to supervise day-to-day management) and the Advisory Councils (which used to assist in water planning) and would have the responsibility of granting water permits, a function previously carried out by the Administrative Court.
- Water was recognized as an economic good. People who use water would pay for it
- A national water authority, ZINWA, would operate as a commercial enterprise. However, Government would ensure that the poor and disadvantaged would continue to have fair access to water.

While the water reforms could have had a local trigger in the form of the 1991/92 drought it was very much shaped by international donors (Manzungu, 2002; 2004). This is echoed by Campbell (2003) who asserts that the independent government of Zimbabwe predicated its policies on the colonial as well as neo-liberal concept of modern over subsistence farming. Campbell (2003) concluded that the old settler-dominated River Boards were somewhat reincarnated (with some black faces) as Catchment Councils that continued to wield power over water issues to the disempowerment of smallholder farmers. It should be added that the situation has changed since the fast track land reform

programme. White commercial farmers who were active in the early stages (Kujinga & Manzungu, 2004; Kujinga, 2002) have been replaced by a black elite.

A research based critique of the current water reforms in relation to how they affect rural livelihoods seems to converge on the consensus that the reforms did not facilitate the development of irrigation in the smallholder sector in general (Manzungu, 2001; Mtisi, 2002). This is ironic given that the post-colonial state, led by people professing indigenous roots, has failed to capitalize on indigenous water and irrigation management experiences. This has rendered the water reforms somewhat cosmetic.

While water allocation was the responsibility of the Water Court before the 1998 Water Act, this function has been delegated to the catchment councils. Catchment councils have had to try and allocate water with no guidelines on how to balance what are sometimes contradictory objectives. Research indicates that decentralisation to catchment and sub-catchment levels has in some cases resulted in a concentration of influence to a few already powerful individuals (Kujinga & Manzungu, 2004). With regards to popular participation in water management, the state allocated itself disproportionately huge powers somewhat in contradiction to the democratic claims showing a lack of appetite for strong local institutions with sufficient political clout to complement the positive aspects of the water reform (Manzungu, 2001).

2.2.5 The Zimbabwe National Water Authority (ZINWA) Act

The ZINWA Act of 1998, created the Zimbabwe National Water Authority (ZINWA), a 'parastatal' tasked with the responsibility for providing a coordinated framework for planning, development and management of water resources. Additionally, ZINWA took over the commercial functions associated with water provision which were previously performed by the Department of Water Development. The functions of ZINWA vary depending on the level at which it is operating. At national level, ZINWA advises the Minister responsible for water on formulation of national policies, water pricing, water resource development and management. At catchment level, ZINWA's role include, inter alia, ensuring the catchment council discharge its functions in accordance with the Water Act, and assisting catchment councils in planning and coordinating water development and management within a catchment area. Also, ZINWA has exclusive responsibility for selling, supplying and management of 'agreement water[6]'.

Of significance is that the institutional structure of ZINWA is not necessarily tied to hydrological boundary of the catchment area, but extends from the sub-catchment area to the national level. ZINWA functions include technical assistance, the selling of 'agreement water', maintenance and management of former government owned dams, and advising the Minister responsible for water. Given this background, it is therefore important to understand how the reform process affected how water is accessed by the different

[6] Agreement water refers to water behind dams which were previously owned by the government.

stakeholders and this is discussed in the subsequent paragraphs, as well as some of the emerging bottlenecks.

One of the key aspects of the water reform was to open up access to water for all water users, particularly 'new' water users (i.e., communal and resettlement farmers). In the past, water was accessible to commercial interests, namely agriculture, mining and manufacturing industries, and was tied to land. The introduction of water permits for raw water, and agreement water contracts for 'agreement water', which, are not legally tied to land, has provided a basis for broad-based access to water. This represented a significant achievement of the water reform as it untied land and water, and devolved the responsibility for water application from the Water Court in Harare to local sub-offices.

However, despite the achievements as mentioned above, lack of coordination between the water institutions has affected water reforms, and management. Recent work (Mtisi, 2008) suggests that some water users were not aware of the institutions to consult over their water needs. This, for some means, the classification of water into raw and agreement water, and the establishment of two distinct institutions for water management has created a complex institutional environment for water access. Consequently, water users were finding it 'confusing' to gain access to water as they were referred from one institution to another. This is made worse in cases where there is lack of coordination between ZINWA and the Catchment Councils in performing their respective functions. As often ZINWA officials fail to attend Catchment Council Meetings. Underlying the lack of coordination between the two decentralised institutions of water management is the parallel lines of

institutional responsibility and accountability in water management. Since ZINWA officials report to the Irrigation Officer at catchment level, and are accountable to the Irrigation Office and not the Catchment Council, there consequently exists little or no coordination in local level water management as suggested by the water policy.

2.2.6 Water and land resources: Access and Management Post-FTLRP

The Fast Track Land Reform Programme of 2000 marked the emergence of A1 and A2 farmers as a new group of water users, undoubtedly increasing the number of people with access to land, therefore had potential to provide a basis for improved access to water for some 'new' farmers.

Around this coveted access to irrigable land emerged some powerful political interest groups. For example, in the Middle Sabi, A2 irrigators formed the Middle Save Farmers' Syndicate to represent their broad political, land and water interests. Given the political strength of A2 irrigators, which stemmed from their political links, water issues pertaining to the Syndicate were channelled through the local structures of war veterans, and the institutional nodes that linked war veterans to district and provincial administration. At provincial level, water issues were further transmitted through the office of the Provincial Governor to the Minister of Lands, Rural Resettlement for Special Affairs in the President's office, who ultimately aired the Syndicate's water grievances directly to the Minister of Water.

2.2.7 Water resources management: Participation, issues and challenges

The water reform introduced radical changes regarding the participation and representation of water users in the management of and decision making on water. By identifying a broad range of water users as stakeholders in water management, the 1998 Water Act provided a legal basis for the representation and participation of previously excluded water users, namely communal, resettlement and small-scale commercial farmers. The new politics of inclusiveness and participation, at least stated formally, has encouraged local level participation in water management at the sub-catchment council level.

Hitherto, the participation and representation of new water users has been fraught with problems. Participation at sub-catchment level is often stacked against new water users who lack financial resources to travel to attend sub-catchment council meetings. Identification and classification of water user groups from which representatives are elected to the sub-catchment council is problematic, in spite of what the Water Act of 1998 provides for. For example, the act provides for inclusion of 'communal farmers' as a disparate group of water users, even the local level water committees in communal areas barely function and most are formed around ground water resources that barely get mentioned at catchment council meetings.

In cases where communal areas have irrigation schemes, representation at catchment level is organized under the aegis of the Irrigation Management Committees (IMCs).

However, these do not extend beyond the irrigation schemes which they are established for. Therefore, there is no sub-catchment wide organisation of, and for, communal irrigators to provide a basis for electing a representative of communal irrigators to the sub-catchment council. In reality ‘representatives’ of the communal irrigation sector who sit on the sub-catchment council are elected representatives of their particular schemes and not of the sector as a whole. By extension, they represent the interests and concerns of the particular irrigation scheme to which they belong.

Genuine participation in water management can only occur when water users and their representatives are informed and knowledgeable about the water reform. Yet, new water users have little knowledge about the reforms and the legislation that set the parameters for their participation. As such, a lack of knowledge about the water reform makes it difficult for new water users to effectively participate and make informed decisions on water management processes at sub-catchment level.

Moreover, while the framework for a perfect water management system exists, the situation on the ground does not reflect this common belief. The reform process has not taken off as expected owing to a combination of factors ranging from conflicting policies and weak institutional linkages, to insufficient funding. The reasons given in the following subsections help to explain why a properly developed legal framework can only function with the support of other critical pillars, such as technical and institutional support.

2.2.7.1 Donor withdrawal

The water sector reforms in Zimbabwe were largely donor-driven. Several donors pledged to support the reform process. This was very positive, considering that a particular donor would be supporting at most two catchments. There was therefore an opportunity for maximum interaction between the donor organizations and the beneficiary catchments. However, by the time the CCs were to be fully launched, donors started withdrawing their support, leading to a number of stakeholders losing confidence in the whole water reform process, and they too began to pull out. CCs were not yet financially self-sufficient, and this sudden withdrawal of donor support in both financial and technical areas was unexpected.

Without a good financial base, CC activities were doomed to fail, with participation restricted to voluntary work. Volunteers tended to be those who had already established themselves in water management, and therefore had interests to protect. Representation therefore continued to be skewed.

2.2.7.2 Other national programmes

The launching of the water reform process coincided with the land reform process in Zimbabwe. The water sector reforms were aimed at promoting equitable and sustainable utilization with more participation of stakeholders and the introduction of the user pays principle. The land reform programme aimed to redistribute land and to encourage greater

utilization of the national land resource. On paper, these two policies complemented each other. There was a great amount of movement, especially in the commercial sector, with established farmers moving away and new farmers coming in.

However, this process happened so quickly that the water sector lost track of who was utilizing water. The problems were more complex in cases where there were more settlers on a property for which a permit had previously been issued to one user. The reallocation of such a permit to more users resulted in many conflicts. Moreover, new settlers were more interested in consolidating their claim to the new properties than in attending water management meetings. Water issues were therefore thrown aside as the land reform exercise attracted greater attention.

2.2.7.3 Financial stability

The water sector reforms intended to implement the user pays and polluter pays principles. In this respect, permit holders would pay a fee, which was to contribute to water services provision. The Water Fund was created through the Water Act (1998) to facilitate the collection of levies, fees, government contributions and any other support towards water service provision. This was to be deposited into a common pool from where the minister would identify areas of greatest need for the benefit of the water sector. The government would also contribute to the Water Fund, using public funds allocated from the main government budget.

The Water Fund had a potential to realize substantial revenue to be used to improve the provision of water services, as directed by the minister responsible for the provision and management of water. Inflows into the Water Fund have been minimal, with a contributing factor being the cessation of donor contributions. Unease ensued, resulting in many established farmers not paying for their permits, as they were uncertain as to their continuing occupancy on their land with respect to the new land reforms. Increased government responsibilities meant that less and less money was allocated to the Water Fund from the national budget.

Similarly, new farmers were reluctant to pay for water use, as water rights had not been paid for previously. Most of the new commercial water users believed that water is a God-given resource, and therefore there is no need to pay for access to it. The diminishing sources of contributions into the Water Fund therefore meant that there was very little money available to support water service provision and management.

2.2.7.4 Weak institutional linkages

The new Water Act provided a better framework for stronger institutional linkages. It is now a requirement that a number of institutions be consulted before permits for water use can be issued. However, there is little evidence to prove that this is bearing fruit. Not all institutions give priority to water issues. Some continue with their previous approach to water management where their support cannot be fully guaranteed unless they are certain of deriving substantial and direct benefits from their participation.

2.2.7.5 Lack of capacity within key institutions

Key institutions, especially ZINWA, are not adequately staffed to cope with the sudden demands for the provision of expert services. The staffing levels of ZINWA fall short of expected levels, as does the level of expertise. The result is that ZINWA cannot provide sufficient personnel to provide commercial services, nor can it provide statutory functions with funding sourced from the Water Fund. With staffing levels inadequate and depth of expertise questionable, it is uncertain if sufficient funds from the Water Fund would have made much difference to this situation.

Other key institutions, such as the Department of Natural Resources, Agricultural Research and Extension Services (AREX), the Ministry of Water and Rural Development and the Ministry of Lands and Resettlement, are also experiencing inadequate staffing levels that have a negative impact on the whole process.

2.2.7.6 Remuneration for participants

CC and SCC representatives have not been paid directly for their input into water affairs. They were only compensated for travel and subsistence. When finances became scarce, the frequency of meetings was reduced, and user groups were merged to cut down on expenses. This meant that stakeholders could not meet as often as was desirable to discuss water management issues. This new approach was designed to cut down costs;

however, consideration was not given to the main objective of providing more efficient water management at the catchment level.

2.2.7.7 Lack of enforcement of legislation

The new Water Act has been described as technically sound with a solid base for sustainable and efficient utilisation of water resources. However, some vital sections of the act have not been fully enforced; hence, its founding principles cannot be supported. The Water Fund is collecting insufficient revenue adequately to support statutory functions. ZINWA is not financially viable, as the four main accounts that were created (raw water account, clear water account, engineering services account and water levy account) are not self-sustaining; hence the new institution has to rely on the government for financial support. In the process, key and experienced staff has left the organization owing to the working environment.

Similarly, Catchment Outline Plans (COPs) have not been developed in accordance with Section 12 of the Water Act (1998). COPs are to be developed by stakeholders, and should serve as a guide on water management within their catchment areas, as well as on the interventions to take in the event of scarcity, and therefore excess demand. Water quality issues and environmental aspects are also covered in the COPs. The reasons for non-development of the COPs range from a lack of capacity for their development, financial constraints and general lack of coordination among stakeholders.

2.2.7.8 Different levels of appreciation of water

Water management representatives are from local authorities, industry, commercial farmers, communal farmers and other interested parties. While all representatives were expected to sit at the same table to discuss water affairs, it was clear that the priority of each group was to protect its own interests. Communal farmers were the weakest and most disadvantaged sector, with the least appreciation of water for commercial use. They were not given equal access to the resource, despite management being conducted through SCCs, which were believed to involve such vulnerable user groups.

2.2.7.9 Political interference

Politics always plays a role in the success or failure of any process. In this case, there was a marked political influence in the pricing of water. In a bid to retain popularity, politicians aimed to keep the price of water as low as possible. Politicians frustrated the implementation of the pricing policy, which cannot afford to subsidise water service provision to maintain standards in good water service

2.3 Conclusion

Of crucial importance to note in Zimbabwe's water reform is that, while the water reform was built around neo-liberal principles couched within the concept of integrated water resources management, the implementation coincided with a radical transformation in

state governance and partly because of the implementation of the fast track land reform programme. Such developments from 2000 onwards provided a challenging context for the water reform, not least because the transformation of the state and the narratives that informed the fast track land reform, were anachronistic to the neo-liberal approaches embedded in the water reform.

The water reform was mainly driven by the global IWRM discourse, which has principally shaped the water reform policy in Zimbabwe. This was achieved at the expense of local historical grievances of past denial of access to water. Broadly, the historical construction of communal areas (the then 'native reserves') and communal irrigation schemes in marginal agro-ecological areas, characterised by limited water resources, poor soils, drought proneness, high population densities and degraded environmental conditions, features acquired during the colonial period, are what still define rural areas, and their access to water for productive agriculture.

Within this context, the water reform was implemented and overlaid on top of an underlying maze of inequality of water access and skewed distribution of land to the extent that the reform continued to provide privileged access to water to water users who already enjoyed better access to water and land. As such, the water reform provided limited possibilities for increased productive uses of water for new water users residing in communal and resettlement areas.

However, one of the key aspects of the water reform has been the creation of parallel institutional processes of water management, which are often contradictory to each other. ZINWA institutions provide technical assistance and advice to catchment and sub-catchment council. On the other hand, catchment and sub-catchment councils are constituted by popularly elected representatives and represent the democratic aspect of the water management. Yet, ZINWA undermines decision making at catchment level, and the viability of sub-catchment councils in sub-catchment areas that predominantly rely on agreement water. Further, the separation between technical and participatory aspects of water management, which lie at the heart of the parallel institutional process, have resulted in the compartmentalization of water services, which does not augur well with livelihood enhancement goals.

CHAPTER 3 - THEORETICAL FRAMEWORK

3.0 Introduction

Water resources management encompasses a range of issues such as water allocation, property rights, water markets, regulation, jurisdictional responsibility and social attitudes and behaviours. Such follows also for irrigation water resources management. And for us to be able to study and understand these issues holistically, and how they are related to irrigation water management, the theoretical approach needs to be broad and analytically flexible. Institutions economics, as an approach, is a broad and dynamic analytical framework suitable for such a study. The institutional economics school of thought is comprised of two distinct traditions; the old and the new. However, the justification for using the new economics approach is provided in this chapter.

3.1 Institutions and organisations

There is a range of literature that attempts to define institutions, for example, Searle (2005), Hodgson (2006) and North (1991). Different scholars have derived different definitions and therefore slightly different results when analysing similar problems. This has created problems when trying to compare results that are achieved using a similar methodological and analytical framework. However, North (1991)'s definition[7] seems to be

[7] Institutions are humanly devised constraints that structure political, economic and social interaction (North, 1991)

the basis of definitions by other scholars. Ostrom (2008)'s definition[8] is also important within the context of the research on institutions and the environment.

This study will adopt a definition of institutions that encompasses both North (1991) and Ostrom (2008). By omission, North (1991)'s definition implies that interactions with the environment are secondary to political, economic and social interactions whereas Ostrom (2008) notes that institutions are rules that can be used at multiple levels of analysis and such a definition does not seem to place priority of one factor over another.

North (1993)'s definition makes evident the embeddedness of economic processes within social and political processes and more importantly, it indicates that a necessary condition for economic change is the successful interaction between institutions and organisations. Political factors need to be considered alongside economic factors whenever analysing any economic phenomenon. Such a point is reiterated by North (1993), who argues that it is politics that shape economic performance because they define and enforce economic rules of the game.

Furthermore, North (1993) also claims that his analysis of the characteristics of institutions implies that it is essential to change both the institutions and the belief systems for successful reform since it is the mental models of the actors that will shape choices. Although North (1993) is specifically referring to economic change and economic

[8] Institutions refer to the rules that humans use when interacting within a wide variety of repetitive and structured situations at multiple levels of analysis.

performance as a whole, his analytical framework can be adapted to a micro-level and this forms the basis of the analysis of irrigation water management in Zimbabwe in this study.

3.2 The neo-classical economic theory

The neo-classical economic theory played a central role in the public policy shift from the monopoly paradigm with strong government intervention to the liberalization of utility sectors in the early 1980s (Groenewegen, 2005; Geradin, 2006; Guthrie, 2006). However, the removal of governmental interferences and the devolvement of public sector activities to private contractors have not produced consistently successful results (Williamson, 2000; Schouten & Pieter van Dijk, 2007).

Institutional economists argue that this lack of achievement is in part due to the reliance on neo-classical economic theory, which focused on economic coordination via the price mechanism and production efficiency while ignoring considerations such as rules, behaviours and social norms (Coase, 2000; North, 2000; Joskow, 2008). Their argument suggests that since lessons learnt from new institutional economics (NIE) can provide valuable insights into public policy-making (specifically the process of restructuring); NIE should therefore have more clout in public policy-making (Joskow, 2008).

NIE is indeed gaining widespread attention in social science literature as it is becoming a more mainstream subject (Joskow, 2008). Particularly with respect to liberalization of utility

sectors, NIE is increasingly used to analyse modes of economic coordination (Rothenberger & Truffer, 2003).

3.3 The Traditional Approach

The conventional economic analysis, based on neo-classical theory, generally does not provide an adequate explanation of the role institutions play in influencing economic phenomenon (Sharma, 2012). Markets play a central role in neo-classical economics and it is here that institutions enter. Sharma (2012) argues that relegating the role of institutions to ensure the smooth functioning of markets is a narrow and simplistic approach. Similarly, relegating the role of government to that of a non-interfering facilitator of market interaction also neglects other roles that governments may play.

Two fundamental assumptions based on the neo-classical theory include (North, 1993):

- Assumption of scarcity and hence competition
- Instrumental rationality[9]

The first assumption is typically also adopted in new institutional economics (Sharma, 2012). However, the analytical approach to dealing with scarcity and examining competition is different. The new institutional economics tradition recognises that

[9] Rationality is instrumental when it treats things and other persons as means and not ends in themselves. Caporaso *et al,* 2002) states that economists working within this framework assume that individuals have an instrumental attitude.

competition is not necessarily the best option when dealing with all types of economic goods.

The second assumption is discarded in new institutional economics as it implies that ideas and ideologies do not matter, and efficient markets; both economic and political, characterise economies (North, 1993). The second assumption considerably impairs the ability of neo-classical economics to be significantly useful as a methodological framework for analysing economic phenomena (Sharma, 2012). One of the main reasons for this deficiency is the relegation of 'ideas and ideologies' despite the fact that these factors play a key role in economic interactions. According to Sharma (2012), neo-classical has a tendency to isolate the economic from social factors and polity, so are institutions being relegated to a secondary role in the analysis. This scenario presents a challenge because institutions need to be at the centre of any meaningful analysis and especially an analysis that leads to the formulation of government policies.

Challen (2000) even notes that the role of institutions goes well beyond that of supporting markets, given that a vast range of decisions for resource allocation are made under institutional arrangements other than those providing for private decisions and market trading. Furthermore, a view of economic behaviour that fails to recognise and explain this diversity of institutions is incomplete.

3.4 The New Institutional Economics Approach

Given the limitations explained above, the New Institutional Economics (NIE) was the chosen methodological framework. It is important to appreciate that old and new institutional economics have some common features that distinguishes them from the orthodox (neo-classical) economics, that is, the integration of institutions and institutional arrangements in economic analysis. In addition, both the old and new institutional economics have perspective of many of the neo-classical economics assumptions.

For instance, instrumental rationality is completely discarded and is seen as a constraint in meaningful analysis. Engle *et al.* (2007) provides an excellent critique of instrumental rationality and provide further support to the idea that institutions do matter. The argument is that the human mind is not a general problem-solving machine. Instead of deliberately and analytically processing all available information to calculate which action will provide the greatest expected utility, people can and do rely on routines, rules, and roles or affect when deciding what to do in a given situation. They can also bring in information technology or experts to provide advice.

The concept of evolution is a fundamental tenet of institutional economics (Sharma, 2012). Economic, social and political phenomenon is not static and as such, conceptual frameworks must also be evolutionary. The evolutionary nature of institutions is well acknowledged by the key proponents of both main streams of institutional economics (new and old institutional economics). In order to find how irrigation water management has

progressed over time, through the land reform programmes in Zimbabwe, is therefore important to understand the crucial impact of institutions on the decision of how to formulate a sustainable irrigation water management framework and how such decisions have also evolved over time.

However, notwithstanding the commons between the old and new institutional economics, these are quite different traditions. The starting point for analysis is one significant difference. According to Langlois (1989), the old institutional economics approach is often referred to as 'methodological holism', implying that it takes the view that individual tastes and preferences are not given but instead constrained by a set of evolving institutions (Hodgson, 1993). On the other hand, the new institutional approach is often referred to as 'methodological individualism' (Rutherford, 1989), suggesting that it assumes the position that there is an institution-free- state of nature (Hodgson, 2003). In addition, the original or old institutional economics is critiqued as lacking a systematic theoretical framework, empirical analysis and as over emphasizing economic history (Groenewegen, 2005; Joskow, 2008). Hence NIE theorists generally relegate this initial approach "to the history of economic thought" (Williamson, 2000).

The other difference is based on the fact that while the old institutional economics rejects the neo-classical economic theory, the new institutional economics approach actually seeks to build upon, modify and extend the neo-classical economic theory (Rutherford, 1989) in an attempt to take into account a range of factors that are generally ignored by neo-classical theory (North, 1993). According to Hodgson, 1989), the link between neo-

classical and new institutional economic is important as it means that the new institutional economics approach accepts some of the propositions of neo-classical economics. For instance, markets are central to the neo-classical approach and are considered to be key institutional structures, making them an important phenomenon to be analysed in the new institutional economics approach. Chavance (2009) supports the linkage between the neo-classical economics and the new institutional economics approach by stating that alongside the acceptance of markets as a means of allocating scarce resources, the neo-classical emphasis on efficiency is retained in new institutional economics, primarily through the new institutional economics emphasis on minimising transaction costs. Table 3.1 below shows some of the key differences and similarities between the old and new institutionalisms.

Table 3.1: Comparison between old and new institutional economics

	Aspects of comparison	Old Institutionalism	New Institutionalism
1	**Generic scope**	Macro-analysis of complete institutions	Macro-analysis of incomplete institutions
2	**Assumptions**		
	• Interdependence	No	No
	• Information	Complete	Incomplete
	• Rationality	Comprehensive	Bounded
3	**Unit of analysis**	Institutional structures	Institutional structures
4	**Causal explanations**	Institutional structures determine individual behaviour	Incomplete institutions create incentives for opportunistic behaviour
5	**Focus**	On formulation of classification of institutional structures	On opportunities and constraints built into institutional structures
6	**Limitations**	• High level of aggregation • Ad-hoc description • Individuals do not calculate	• High level of aggregation • Ad-hoc explanations

Source: Adapted from Saleth & Dinar (2004)

The central unit of analysis in old institutional economics is power (Stilwell, 2005; Stanfiled, 1999). The old institutional economics approach seeks to examine the institutions that shape and influence power with an economy. However, the central unit of analysis in the new institutional economics approach remains the individual and it seeks to examine the institutions that shape interactions between individuals (e.g., with regards to this thesis, issues that include property rights for water). This aspect of institutional economics places the new institutional economics closer to neo-classical economics on the methodological spectrum and distinguishes it from old institutional economics.

A new institutional economics approach is thus adopted in this thesis since it goes beyond the narrow prescriptions of neo-classical economics and offers a more structured approach and relevant approach to the study of irrigation water resource management in Zimbabwe.

3.5 The New Institutional Economics (NIE) and its origins

NIE has its origins in what is known today as original or old institutional economics, which departed from neo-classical economics in its recognition of institutions' importance in structuring human behaviour and economic exchange (Hodgson, 2000; Menard & Shirley, 2005). Beyond incorporating institutions into economic analysis, this approach also focuses on policy goals, understanding the process of economic change as well as human behaviour, learning and beliefs (Hodgson, 2000).

Departing from original institutional economics, NIE seeks to merge institutionalism into neo-classical economics by analysing institutions with economic theory tools and accepting the assumptions of scarcity and competition (Williamson, 2000; Menard & Shirley 2005). The variety of methods is a result of NIE being a compilation of different theories and traditions such as economics, law, organization theory and industrial organization as well as drawing from political science, sociology, anthropology, psychology (cognitive science in general) and evolutionary biology (Brousseau & Glachant, 2008).

Despite its varied components and multidisciplinary approach, NIE operates within the field of economics; incorporating some principles of neo-classical economics, modifying others and adding new dimensions. For instance, by making institutions central to comprehending economies and assuming that transactions have positive costs, NIE discards neo-classical economics' notion of a frictionless market with zero transaction costs (Menard & Shirley, 2005; North, 2005b; Williamson, 2008a). In fact, as transactions and their costs lie at the core of NIE theory, one branch of the theory is referred to as transaction cost economics, which employs the lens of contract to assess economic organization.

Furthermore, NIE has moved beyond neoclassical economics' assumption of equilibrium where all actors can concurrently maximise their utility, as the theory recognizes the disequilibria of market failures that necessitate non-market solutions (i.e. institutions) to cope with humans' limited cognition (Chhotray & Stoker, 2009).

In addition, the new institutional economics approach puts attention on the adequacy of information and what it means to act rationally. While neo-classical economics typically assumes unbounded rationality, the new institutional economics takes the view that the rationality is bounded (by time and information) (Sharma, 2012). Again, on one hand, the neo-classical theory agents are assumed to have complete or near complete information, which then allows the agents to act in a rational manner. On the other hand, with regards to the new institutional economics approach, North (1993) notes that individuals have incomplete information and limited mental capacity by which to process information. In such a world, ideas and ideologies play a major role in choices and transaction costs result in imperfect markets. Such asymmetrical information problem characterise many economic, social and political processes.

Similarly, Searle (2005) also notes the importance of ideas, ideologies and mental models by suggesting that at no point is it ever suggested that the reality described by economic theory is dependent on human beliefs and other attitudes. North (1993)'s discussion of ideas, ideologies and mental models is particularly pertinent as it highlights the inadequateness of the neo-classical analytical framework and can extend to a variety of issues in irrigation water management in Zimbabwe.

However, institutions and institutional arrangements are not a panacea for solving problems faced by irrigation water management in Zimbabwe. Just as it would be fallacious to ignore institutions, it would be fallacious to overestimate the efficacy of institutions. As North (1993) notes, institutions are not necessarily or even usually created

to be socially efficient, rather they, or at least formal rules, are created to serve interests of those with bargaining power to create new rules. Similarly, Ostrom (2007) also warns against viewing any particular institutional arrangements as a panacea for solving natural resources (especially common-pool resources) problems due to heterogeneity and complexity of problems facing different environmental resources.

A balanced view however emphasises the development of institutions as an aid to creating more socially acceptable (and also economically acceptable) outcomes (Sharma, 2012). In light of this, institutions are therefore necessary in order to create the 'rules of the game' so that, along with the appropriate enforcement of the rules, acceptable solutions can be achieved. Such a point is reiterated by North (1993) in relation to what he calls *'an economic world characterised by impersonal markets'.* According to North (1993), in order to achieve an acceptable solution in such a world, it entails the creation of institutions that structure the rules and their enforcement as to alter the pay-offs to induce the cooperative solutions.

Such concepts are relevant as they can be adapted to this study. For instance, the idea of altering pay-offs in order to induce cooperative solutions is necessary especially with regards to irrigation water allocation disputes that are of increasing importance as water supplies diminish and need to be better managed.

3.6 Objectives of New Institutional Economics

NIE holds that the diverse performance of economies can be explained by understanding the process of economic change (North, 1990). In turn, it is possible to comprehend this process through assessing institutions that can be defined as rules diminishing uncertainty in economic exchanges. Furthermore, the transformation can be understood by analysing institutions' role in economic growth as well as their interface with modes of coordinating economic exchange among human actors (Williamson, 2000; Menard, 2004; North, 2005a).

Moreover, the theory aspires to explain why and how institutions emerge, function and evolve (Joskow, 2008; Williamson, 2008b). In addition, NIE seeks to expand the static conventional economic theory into a dynamic one by including the dimension of time and creating modest hypotheses about economic change to enhance the utility of social theory to address human problems (North, 2005b). Simultaneously, the theory is concerned with explaining how to improve economic performance, and hence welfare, by comprehending human incentives, preferences, perceptions, beliefs and learning (North, 2004).

Under the purview of transaction cost economics, the theory focuses on micro-analytic methods looking at institutional arrangements that sustain and safeguard transactions (Menard, 2004). In order to comprehend why certain institutional arrangements emerge and interact in different institutional settings, NIE utilises a comparative institutional analytical framework that is founded on feasible alternatives (not hypothetical

benchmarks) that are inherently flawed in comparison to the theoretically optimal solution (Klein, 1996; Coase, 2000; Joskow, 2008; Williamson, 2008b).

Furthermore, NIE's goal is to understand and explain the means of coordination (e.g. contracts, institutions and organizations) via the application of rational choice theory, which focuses on individual choice. At this level, NIE aims to explain both the internal structure of organizations as well as the question of when and why transactions are coordinated by hierarchical means instead of the market mechanism; hence alternative forms of institutional arrangements such as hybrids between markets and organizations are addressed. Additionally, NIE theorists delve into the black box of firms and markets in order to understand the process of production, exchange and economic performance as well as to comprehend the complex inter-relationships between formal, informal, private and public institutions (Coase, 2000; Williamson, 2000).

3.7 Principles of New Institutional Economics

To provide more insight about the main objectives of NIE theory, some of its basic premises are described below. NIE operates on the assumption that social structures can be explained by individual choices because, in accordance with methodological individualism, collective actions can emerge from individual choices (Menard, 1995; North, 2005b). Therefore, before examining the definitions of institutions and other mechanisms of coordination, it is necessary to explicate the theory's assumptions and characterisations of human actors that profoundly affect the process of economic exchange.

3.7.1 Behavioural Assumptions and Human Actors

NIE adopts one of the fundamental characteristics of neoclassical economics, namely the rational choice model, which assumes that individuals choose the alternative that maximizes their personal preferences and thus make decisions that lead to efficient outcomes (Eggertsson, 1990; Williamson, 2008a). Hence, NIE adopts the lens of individual choice (Williamson, 2008b) that focuses on decision-making based on the assumption that individuals have the freedom to choose between alternatives (Peter, 2004).

In contrast with neoclassical economics, NIE rejects the assumption of instrumental rationality as it recognizes that individual choices are influenced by mental models that are based in part on values, norms and experiences (North, 1995). In further disparity with neoclassical economics, NIE assumes that human actors have bounded rationality (Simon, 1957) rather than perfect knowledge. This concept describes human actors as lacking complete knowledge to assess their decision alternatives due to their cognitive limitations, time and information constraints (Williamson 2000; Brousseau & Glachant 2002). Therefore, human actors accumulate transaction costs in the process of attaining information as they invest time and expend resources (Menard & Shirley 2005).

Furthermore, bounded rationality and self-interestedness lead to opportunistic behaviour as information asymmetries arise due to human actors' differing levels and quality of information that enables some to maximize their personal preferences. Furthermore,

uncertainty is prevalent because human actors not only have incomplete knowledge but they also interact in a world of continuous and unpredictable change (Brousseau & Glachant, 2002).

While the above assumptions of human behaviour have negative implications for an efficacious transaction process (as they induce transaction costs), NIE also operates on the premise of "feasible foresight," which helps offset costs due to the assumption that humans have the capacity to think ahead; enabling actors to mitigate problems before they arise (Williamson, 2008a). However, although NIE recognizes human actors' ability to process information and learn from past experiences (which can assist in offsetting transaction costs) ultimately, human actors cannot escape their limited cognition.

Human actors in NIE include employers, entrepreneurs, managers, owners (shareholders), purchasers, suppliers, and employees (members of organizations), contractees (individuals contracted to provide a service), property-rights owners, non-owners, voters, legislators and policy implementers (North, 2005b). These actors, subject to the above premises of self-maximization with bounded rationality, utilize resources and play games via decision, use and access rights. They also make choices that are coordinated by institutions that evolve through trial and error (Brousseau & Glachant, 2008).

Since the presence of uncertainty necessitates that individuals anticipate future wants and needs, it is argued that a certain class of human actors, namely entrepreneurs, emerges,

that has the skills to recognise and implement opportunities by making decisions in the face of uncertainty; hence organizing by instructing others and paying wages (Coase, 1937). Therefore, an entrepreneur must motivate an employee, who may have different goals than the entrepreneur, to accomplish the entrepreneur's objectives.

Conditions of asymmetric and incomplete information create what is called a principal-agent problem where there are conflicting objectives between a principal (e.g. entrepreneur) and an agent (e.g. employee) that affect a collective outcome such as making a profit (Chhotray & Stoker, 2009). While there is often no outright controlling in contractual arrangements, the principal gives explicit instructions about the desired objectives and therefore have implicit control as their prevailing beliefs shape rules and norms, which become institutionalised over time as agents adhere (North, 2005a).

In outcome-based arrangements, a certain amount of freedom is implied as the agent can decide (i.e. based on the freedom of choice assumption in the rational choice model) not to fulfil the duties and forfeit payment (Miller, 2005). In such arrangements, either incentive mechanisms (e.g. pay raises, bonuses) or competition among agents, are implemented so that they cooperate (Brousseau & Glachant, 2008). In contrast, contracts based on monitoring the agent's behaviour involve more outright control that necessitates more rules (Miller, 2005).

3.8 Institutions and Institutional Levels

While NIE lacks a single established definition of the concept of an institution, the theory generally operates on the foundation that institutions are systems of rules created to offset uncertainty and risk by providing a social structure that allows humans to gain certain control over their environment (North, 1990; Menard, 1995). On the one hand, institutions steer human behaviour by placing constraints on the number of choices available to human actors and determining who has rights of access, decision or use (North, 2005b). On the other hand, institutions are human actors' instruments: NIE theorists conceive that institutions emerge as a result of cumulative individual choices that are continually reshaped by human beliefs and decisions (Williamson, 2000; Groenewegen, 2005; Menard & Shirley, 2005). Hence, NIE theorists argue that institutional contexts are the collective result of institutions that tend to emerge spontaneously via individual choices (Klein, 1996).

Due to this evolution of the institutional context, it is held that institutions are neither fully adapted to coordination demands needed to facilitate exchange, nor completely efficient as they are imperfect and temporary. Therefore, there is no guarantee that the most efficient institutional arrangements will be chosen (Brousseau & Glachant, 2008). However, institutions contain an element of predictability as institutionalised rules and norms hold a certain level of stability since they have constraints that inhibit rapid change (Nabli & Nugent, 1989).

As institutions change, societies adjust themselves accordingly to adopt the changes (Shah *et al*, 2001, Williams, 1999). According to Williams (1999), the adaptation is captured in a four level phenomena as shown in Figure 3.1 below.

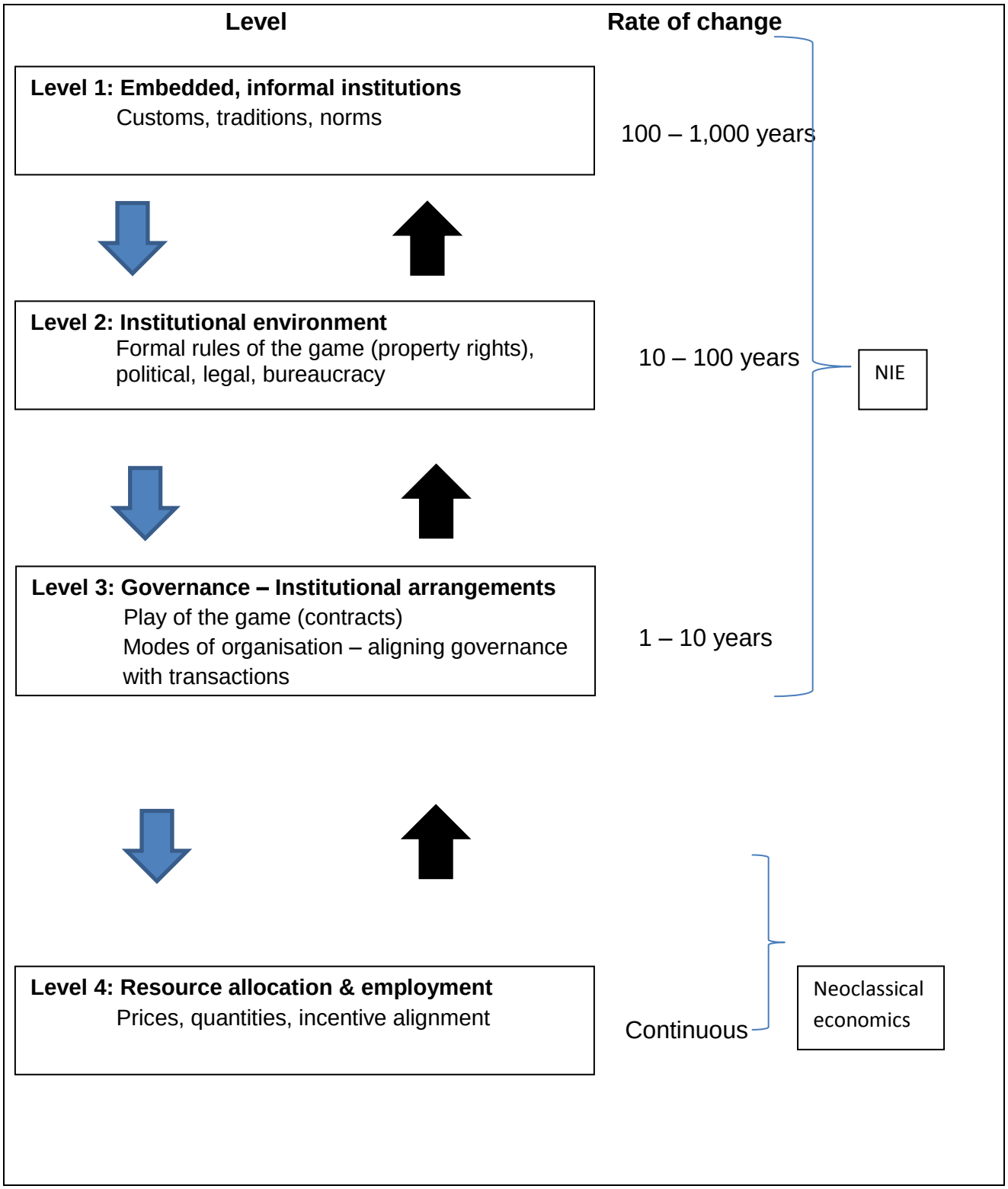


Figure 3.1: Levels of economic institutions[10]

[10] Adapted from Williamson, 2000

The first level is described as embedded institutions that are comprised of informal institutions such as norms, customs, traditions (based on beliefs), choices and goals of individuals (Williamson, 2000; Menard & Shirley, 2005). According to Williamson (2000), these fundamental socio-cultural institutions change slowly as adaptation takes at least a hundred years because they are difficult to alter.

At the second level lies the institutional environment that delineates the formal rules of the game, which includes the political system - with a focus on property rights (Williamson, 2000; Joskow, 2008). While change at this level is described as occurring faster than at the first level, adjustment still takes at least ten years.

At the third level is governance, which is comprised of institutional arrangements that define the play of the game. This level refers to contracts, firms and other modes of coordinating economic activities that should provide order, offset conflicts and allow actors to maximize personal preferences (Williamson, 2000). Change at the level of institutional arrangements occurs more rapidly since this level is less path dependent than the first two levels.

At the fourth level, the institution of resource allocation and employment, change occurs continuously as it involves the daily operation of the economy with constant and spontaneous adaptation. This is the purview of neoclassical economics that looks at the outcome of the institutional infrastructure (established in the first three levels) (Williamson, 2000).

In contrast to neoclassical economics, which does not aim to explain economic change, NIE focuses on levels one to three and hence looks at the institutional processes and interactions that help explicate change and sustain a market economy (North, 2005b; Joskow, 2008).

Wliiamson (2000)'s framework illustrates a key feature of new institutional economics that adds to its usefulness as an analytical framework. The feature is its dynamic or evolutionary nature. The different levels of institutions presented above all evolve over time. For instance, according to Sharma (2012), changes in governance structures (level 3 institutions) will, over time, have an impact on level 2 and level 4 institutions and vice-versa holds. Moreover, treating different levels of institutions as evolutionary allows for any analytical propositions to be multi-dimensional, which is quite useful in the study of irrigation water resource management, a phenomenon which is complex, with no single solution in place.

3.9 A review of theories: an application of NIE principles

3.9.1 Property rights and water markets

Typically, a market is created in order to facilitate the exchange of goods and services. How well a market works is generally determined by its ability to generate efficient outcomes. Neoclassical economics traditionally links the definition of market efficiency with the concept of *Pareto efficiency.* Pareto efficiency arises in situations where no one can be

made better off without someone being made worse off. This implies that there could be institutions where making someone better off at the expense of another is not an indication that an economic situation is inefficient or wasteful.

It should therefore be made clear that within the neo-classical school of thought, the concept of economic efficiency is quite distinct from achieving an equitable income. According to Bannock *et al (*1998), achieving economic efficiency relies on three different types of efficiency;

- Productive efficiency – output is produced at lowest cost
- Allocative efficiency – resources being allocated to the production of the goods and services society most values
- Distributional efficiency – output is distributed in such a way that consumers would not wish, given their disposable income and market prices, to spend these incomes in any different way.

In this case, allocative and distributional efficiency potentially need to take precedence over productive efficiency with regards to water. In simple terms, the argument is that regardless of cost, water needs to be available for survival. It is allocative and distributional efficiency that can be impacted significantly through policy reform.

While neo-classical economics focuses heavily on analysing efficiency, it pays scant attention to the ‘rules of the game’, that is, the rules governing interaction in markets. As

Mantzavinos (2001) notes, neo-classical economics seems to neglect thoroughly the role of rules in the market process. And by ignoring the rules of the game, neo-classical economics effectively does not provide adequate analysis of the institutional framework in which market processes take place. As put forward by Mantzavinos (2001), the market is mainly viewed by neoclassical economics as an allocating machine that solves the main problem of society of what to produce, how and for whom. It is the neglect of the institutional arrangements surrounding market processes that makes a new institutional approach a more attractive and viable analytical approach.

The role of institutions and institutional arrangements concerning markets is often underestimated. The problems of asymmetric information and barriers to entry that are present in most market structures today can to some extent be alleviated by institutions.

3.9.2 Theory of collective action

Collective action approaches are widely used by self-interested individuals to manage common property resources such as irrigation water. Collective action and self-governance help manage common property resources and avoid the “tragedy of the commons” (Runge, 1986; Ostrom, 1990; Bromley, 1992). Rules and endogenous authority systems can encourage members to co-operate towards a group strategy because the rules provide certainty about expected actions of others (Runge, 1981; 1986). Collective action is affected by attributes such as group size, similarity of group characteristics and goals (Olson, 1982). Ostrom (1990) identifies custom and social conventions as facilitating

collective action (Nabli & Nugent, 1989). According to Runge (1986) low incomes, critical dependence on a local resource and high uncertainty with respect to those resources can lead to collective forms of management. The more homogeneous a community, the more likely that the optimal outcome is in communal management since people will share similar economic goals and uncertainties as well as socially accepted norms of cooperation. Runge (1986) argues that people will cooperate for their common good without provision of external (state) coercion if they can be assured that a critical mass of users obey a common property arrangement (Moorhead & Lane, 1993).

Institutions can also be considered a form of capital. A society's institutions can be regarded as cultural or social capital (Berkes & Folke, 1992). Social capital is closely linked to collective action in irrigation water management in developing countries. Some consider social norms, cultural values, trust and reciprocity and social sanctions as social capital (Rudd, 2000; Wolcock, 1998). Social capital is productive, self-reinforcing and cumulative and can improve economic performance. Social capital enables participants to act effectively to pursue shared objectives. There are stronger incentives for cooperative action by local groups in cases where exploitation would occur from purely individualistic behaviour under 'common property resource systems' (Ostrom, 1990).

Property rights are related to collective action and self-management. The absence of clearly defined and well-enforced property rights and the prevalence of inefficient and corrupt judiciaries and bureaucracies significantly increase risks and costs of transactions and in many cases transactions from occurring at all. Coase (1960) believes that

government involvement is inefficient if property rights are well established. Demsetz (1967) and Coase (1960) argue that, in the absence of transactions costs, private property rights is the most efficient system of land use. Property rights lower transactions costs and exclusive rights provide sufficient incentives to encourage development and cultivation (North & Thomas, 1977). Property rights for water users entail right to access a certain amount and quality of water, collective protection against conversion of irrigated lands, use of irrigation infrastructure, irrigation services etc. However, if transactions costs are high private property rights may not be the best property system.

3.9.3 The economics of institutions and the source of economic growth

According to Matthews (1986), institutional changes have made a positive contribution to economics and growth. The idea of institutional change as a source of economic growth has taken two distinctly different forms:

- Institutions need continual adaptation in the face of a changing environment of technology and taste. Institutional change is a necessary part of economic change but not an independent source of it.

- The movement towards Pareto-superior institutions cannot be achieved at once but as a very long run, possible permanent process. This process can come about by the continual emergence and diffusion of institutional innovation, comparable to technological innovations. In other words, it can come about in a manner of a

repeated game; in which people gradually learn or are selected against if they do not.

For the state, it is easier to alter institutions than the private parties do, which implies that the state involvement with institutions is inherent. This is because the state is ultimate guarantor of property rights. It has to decide what kinds of rights and obligations it is prepared to recognize and enforce.

In addition, attention to the institutional environment has become increasingly common in economic history and it has deeply enriched an understanding of how economies develop through time (North & Thomas, 1973; North, 1990; Drobak & Nye, 1997). Economic development is no longer regarded as a gradual, inevitable transformation from local autarky to specialization and the division of labour. Instead, development is seen as a response to the evolution of institutions that support social and commercial relationships. Economic growth thus depends on the degree to which the potential hazards of trade (shirking, opportunism and the like) can be controlled by institutions, which reduce information costs, encourage capital formation and capital mobility, allow risks to be priced and shared and otherwise, facilitate cooperation.

3.9.4 The Conventional Theory of the Firm

What economists usually mean by ‘the theory of the firm’ is the theory of production, but not in the sense of the theory of the firm as a legal entity. In economics textbooks, the ‘firm’ is a production function or production possibilities set, a ‘black box’ that transforms inputs into outputs. Given technology, input prices and a demand schedule, the firm maximizes money profits subject to the constraint that its production plans must be technologically feasible. The firm is modelled as a single actor, facing a series of straightforward decisions: what level of output to produce, how much of each factor to hire, and so on. Similarly, the firm’s size and product range are usually explained in terms of production costs: economies of scale imply larger firms, while economies of scope justify the multiproduct firm (Spulber, 1989). Instead, the new institutional economics sees the firm as a set of arrangements - as an organization - itself worthy of economic analysis.

3.9.5 Irrigation Water – A Common Pool Resource (CPR)

Historically, water resources around the world have been viewed as common resources (Sharma, 2012). One long-term research programme that can help explain how and why the boundaries of institutions might affect the implementation of different operational resource management techniques, such as conjunctive management, is the study of CPR management, developed most notably by Elinor Ostrom and colleagues. CPR management theory evaluates how institutions influence the use of CPRs, such as water, fisheries, and forests (Ostrom, 1990, 1998, 1999). CPRs exhibit varying degrees of two key characteristics:

- Difficulty in excluding users and
- Subtractability of supplies, where each resource user reduces the supply available for the welfare of others (Ostrom *et al,* 1994; Berkes *et al,* 1989).

The first characteristic can lead to problems of free-riding or insufficient maintenance of supplies. The second characteristic can create problems of over-appropriation or congestion. Conventional wisdom may presume that the use of CPRs leads to the "tragedy of the commons," or ultimate destruction of the resource, yet CPR management studies have shown that CPR users often devise institutional arrangements to resolve these dilemmas (Blomquist, 1992; Ostrom, 1990; Ostrom, *et al,* 1994; Schlager, 1990; Tang, 1992).

Policymakers and public administrators face a host of problems in managing common-pool resources (CPRs), such as water, forests, and fisheries, due to their physical characteristics. As with public goods, it is often difficult to exclude users from CPRs. Yet, unlike public goods, CPRs are highly subtractable, implying that any one appropriator of a CPR can deplete the supply of that resource available to others. Because of these characteristics, CPR users often face problems of overconsumption or resource depletion. The major question therefore is:

> *"What, then, might facilitate more efficient and sustainable CPR management to maintain adequate resources for future generations?"*

An analysis of the tragedy of the commons is useful in understanding the weakness of treating water as an entirely common resource. Many scholars recognize that institutions play a key role in shaping how CPR users coordinate their actions to solve supply and demand dilemmas (Ingram *et al*., 1984; Lam, 1998; Lord, 1984; Ostrom, 1990). As shown in Table 3.2 below, private goods are characterised by both high excludability and high rivalry, while public goods are characterised by low excludability and low rivalry.

Table 3.2: Taxonomy of goods

		EXCLUDABILITY	
		High	**Low**
RIVALRY	**High**	Private goods	Common-pool resources
	Low	Club goods	Public goods (Toll goods)

Source: adapted from Ostrom, (1990)

Water falls in the form of rain, and flows and evaporates with no regard to any boundary. Water is, however, subject to rivalry in consumption and, thus cannot be categorized as a public good. Instead, it is a common pool resource, meaning that there is a finite amount that must be shared in common over a variety of uses and over geographic areas (Dalhuisen *et al.*, 2000).

CPR studies show that effective institutional arrangements for managing resource dilemmas vary depending on physical and community conditions (Lam, 1998). Effective institutional arrangements may diverge across settings, yet CPR studies have identified some general principles of long-enduring, self-governed CPR institutions. The first design principle associated with sustainable CPR governance institutions is the establishment of clearly delineated boundaries around the resource and resource users (Ostrom, 1990, 1998).

CPR theory's boundary principle implies that institutions whose boundaries are congruent with the scale of the physical boundaries of a CPR are more likely to be successful and sustainable. Ostrom notes (1990):

> *"Without defining the boundaries of the CPR and closing it to 'outsiders,' local appropriators face the risk that any benefits they produce by their efforts will be reaped by others who have not contributed to those efforts."*

Literature has shown a clear relationship between the successful resolution of CPR dilemmas and the organization of institutional arrangements that are clearly defined around CPR boundaries. According to the principle, one can assume that in managing water supplies using a method such as conjunctive management, then the institutions governing the basins where water is stored and recovered would be more effective when organized around the boundaries of the groundwater basin.

3.10 Conclusion

As a summary, NIE takes into account the profound effect of institutions on economic interactions as it acknowledges that legal, political, social and cultural institutions affect the performance of an economy (Coase, 2000). Furthermore, NIE employs feasible alternatives in its economic analysis instead of relying on hypothetical ideals and abstract models (as is the case in neo-classical economics) (Coase, 2000). Similarly, the new institutional economics approach, unlike the neo-classical economics theory, broadens the scope of analysis by integrating institutions and institutional arrangements. The new institutional economics approach is able to deal with a large range of phenomenon, not only limited to economic considerations, but also to include social and political considerations as well.

In addition, the theory acknowledges transaction costs and regards institutional arrangements as imperfect and temporary, which is argued as being a more accurate portrayal of economic exchange in the real world than neoclassical assumptions of a frictionless market (Menard & Shirley, 2005). Moreover, human actors are depicted pragmatically as having bounded rationality; not as having complete knowledge of all relevant information (Williamson, 2005). Additionally, NIE's approach keeps significant contact with its focal phenomena (Williamson, 2005).

Lastly, the new institutional economics approach draws upon knowledge from a range of schools of thought, not only in the economics filed, but across other related disciplines as well.

CHAPTER 4 - NATURE AND ROLE OF INSTITUTIONS

4.0 Introduction

This chapter dwells on understanding the nature and role of institutions. Firstly, the chapter attempts to define institutions. The chapter further discusses the management of resources under collective approaches, both from a formal and informal point of view, using studies from other scholars and their inferences. Such was done so as to examine how irrigation water can also be managed under collective approaches using formal and informal rules.

4.1 What are institutions?

Institutions embrace a wide diversity of concepts. Institutions in a broad sense govern and limit human interaction. Societies' institutional framework is the set of rules and constraints that govern human behaviour which can include legal rules, organisational forms, and norms of behaviour and enforcement mechanisms. The most common definition of institutions is that they are "rules of a society that facilitates coordination among people by helping them to form expectations which each person can reasonably hold in dealing with each other" (Ruttan & Hayami, 1984).

Institutions are the rules of the game in society. Formally, they are the humanly devised constraints that shape human interaction. As a result, they structure incentives in human

exchange, whether political, social, or economic (North, 1990). Institutional change shapes the way societies evolve through time and it is the key to understand historical changes. In addition, institutions have been defined as the laws, policies, and organizational arrangements that communities devise to permit, forbid, or require certain human behaviour (Crawford & Ostrom, 1995; Ostrom, 1990). Institutional arrangements can include enforced formal laws governing individual behaviour, public and private organizational arrangements, as well as informal norms and standards shared among communities.

The “rules of the game” definition of institutions is particularly important because it supports market activity, efficiency, economic growth and development. Markets are institutions because they embody rules and regulations, formal and informal which govern their operations. Similarly, formal organizations such as labour unions are institutions because they provide sets of rules governing the relationship both among their members and non-members. Williamson (1985) defined institutions as the “mechanisms which govern transactions “and hence institutions are transactions cost minimising arrangements. However, the crucial question is not how the definitions differ or not but how economic efficiency and distributional features of institutions (Nabli & Nugent, 1989) evolve over time and what their efficiency and distributional implications are.

According to North (1990), institutions are the “humanly devised constraints that shape human interaction. North’s definition is broader and encompasses legal and regulatory frameworks along with cultural, social and cognitive processes which provide a norm

structure to guide interaction. From economics point of view, institutions define and limit the set of choices of individuals (North, 1990). They include any form of constraint that influences the action of individuals and shape human interaction. Institutions can be formal or informal: formal constraints are rules that human beings devise and informal constraints are conventions and codes of behaviour. Institutional constraints include both what individuals are prohibited from doing and under what conditions some individuals are permitted to undertake certain activities. Therefore, they are the framework within which human interaction takes place. They are very similar to the rules of the game as in a competitive team sport. That is, they consist of formal written codes of conduct that underline and supplement informal rules. This means that if the formal rules or the informal codes are violated, punishment may be enforced (North, 1990).

Institutions can be both formal and informal. Apart from written laws, rules and procedures, informally established procedures, norms, practices and patterns of behaviour form part of the institutional framework (Merrey, 1993). After years of tradition, informal practices also become “rules” in their own right, when they are accepted by the society. These formal and informal institutions define and fashion the behavioural roles of individuals and groups in a given context of human interaction, aiming at a specified set of objectives. The key characteristics of institutions are that “they are patterns of norms and behaviours which persist because they are valued and useful” (Merrey, 1993).

4.2 Formal and informal institutions

Informal institutions are not purposively designed but evolve through spontaneous interaction, whereas formal institutions can be purposively designed (Hardin, 1968; North 1990). The difference between formal and informal institutions is one of degree, not of kind, and in many cases some informal institutions gradually become part of their formal counterparts and some formal institutions take informal forms. Informal institutions are also considered extensions and local-level translations of formal institutions.

In reality, however, formal institutions are also derived from and dependent on informal institutions, especially for their stability and strength. This is because informal institutions remain the foundation on which the formal institutions operate. Thus, any effort to design efficient formal institutions has to consider the way new formal institutions interact with prevailing informal institutions (Eggertsson, 1996). Therefore, the formal–informal categorization of institutions is based more on analytical grounds than on any functional reasons.

Although the formal and informal institutions are closely related and linked, analytical considerations warrant their differential treatment because of the fundamental differences in their sources and rates of change (North, 1990) as well as their amenability for inclusion in formal analysis. For instance, changes in formal institutions can be evaluated in either a simple or an extended transaction cost framework. But changes in informal institutions cannot be explained purely from an economic perspective (Eggertsson, 1996). Formal

institutions can be changed through deliberate reform programs, but their informal counterparts cannot be changed.

Similarly, unlike the formal institutions created and maintained usually by the state or through a political process, informal institutions such as norms, customs, and conventions evolve essentially through a socio-cultural process. Informal institutions, unlike their formal counterparts, involve self-enforcing arrangements, especially those operating close to the point where actual decisions are made. As a result, they function with low or no social costs.

In many developing societies, informal rules have a tendency to override formal rules, making the enforcement of formal rules very difficult and thereby affecting performance (Bandaragoda & Firdousi, 1992). While the coexistence of formal and informal institutions is inevitable, situations where some informal rules tend to contradict formal rules are obviously dysfunctional. Also, it is possible that, due to lack of proper enforcement or due to disregard towards the spirit of the written laws, they become ineffective, and are replaced by a set of practices that show a divergence from the declared laws, rules and regulations.

4.3 Role of institutions

The major role of institutions in a society is to reduce uncertainty by establishing a table (but not necessarily efficient) structure to human interaction (North, 1990). In light of this

study, irrigation water resources management is crucial to agriculture, as such, managing the way users behave becomes an essential component. It is also important to note that institutions change through time ranges from conventions, codes of conduct, and norms of behaviour to state law, common law and contracts between individuals (Ostrom, 1991). This further calls for robust structures to manage the human interactions.

Generally, institutions give the structure for exchange that (together with the technology employed) determines the cost of transacting and the cost of transformation. How well institutions solve the problems of coordination and production is determined by the motivation of the players (their utility function), the complexity of the environment, and the measurement and enforcement. Transaction cost of transfer constitutes two parts: the market costs and the costs of time each party must devote to gather information. The greater the uncertainty of the buyer, the lower the value of the asset. The institutional structure also determines the risk to the seller that the contract would be violated.

It is very important to note that the uncertainties with respect of security of rights are a critical distinction between the relatively efficient markets of high income countries today and economics in the past as well as those in the third world today (Ostrom,1986). The subsequent section attempts to discuss how institutions can be collectively used in the management of Common Pool Resources to achieve optimum output.

4.4 Effectiveness of institutions in managing resources: review

Salilih (2007) employed both qualitative and quantitative approach, to assess the contribution of irrigation on household food security and irrigation management and problems associated with it in the case of Zingni and Fetam small-scale irrigation schemes in blue Nile basin of Amahara national regional state. The findings of the study revealed that irrigation's contribution on minimising household's socio-economic poverty significantly vary from one irrigation scheme to another. Its contribution also vary across irrigation systems depending on the physical structures of the scheme, amount of irrigation water, plot size, availability of agricultural inputs, management qualities and educational status of individual farmers to accept new ideas. Management of irrigation water resources, as was being studied, could follow the same argument where local settings vary and hence, management practices may also vary from one setting to another. However, the study will attempt to find the best way in which irrigation water resources will be managed for optimal irrigation water productivity.

Checkel & Alamirew (2007) conducted a study on technical and institutional evaluation of Geray irrigation scheme in west Gojjam zone, Amhara region, Ethiopia. The technical evaluation was made by looking into the selected performance indicators such as conveyance efficiency, application efficiency, water delivery performance and maintenance indicators. The results of the study indicate that the scheme has been managed by Water Users Association for four years, despite the fact that it was

constructed 27 years ago. Moreover, the study shows that the overall performance of the Water Users Association in terms of managing the schemes was very poor.

Furthermore, support services rendered to the beneficiaries were minimal. There were very few indicators that production was market oriented. Ironically, farmers did not recognise market as their problem. Conflict resolution has been the duty of the *Kebeles* Council and Water Users Association has no legal authority to enforce its by-laws. Such a scenario could suggest that lack of empowerment of WUAs and failure to accept (informal) local rules could lead to ineffective and inefficient irrigation water management. This study seeks to evaluate the nature of linkages between formal and informal rules and how best, at the minimum cost, could be used to manage water resources effectively.

Gebremedhin *et al.* (2002), in their study, analysed the nature and determinants of collective action and its effectiveness in managing woodlots in Tigray, northern Ethiopia. The empirical models adopted by the study were Tobit, Probit and OLS. Results of the study revealed that despite the community, benefits were limited due to various restrictions on use of woodlots, collective action in managing woodlots generally functions well in Tigray, which supports the role of community resource management in redressing resource degradation. The econometric analysis showed that the factors that significantly affect collective action include population density, market access and presence of external organisations promoting the woodlot. Given that irrigation water is also a CPR, it is thus necessary to find out how best the community (water users) can collectively manage the irrigation water resources efficiently.

Benin & Pender (2006), using data from 98 villages in the highlands of Amhara region, examined the determinants of collective action and its effectiveness in communal grazing lands management and the effect of restricting access and use in certain grazing areas on the condition of other communal grazing resources. The results of descriptive analysis reveal that more than one-half of the communities had at least one restricted grazing area, with the total area in each of those communities averaging twenty-two hectares. In addition, collective action is more likely to be successful in communities that have large areas, are far from markets, and where wealth is more equally distributed. Where there is more alternative source of feed and in irrigated areas, collective action is not likely to succeed. In addition, increasing the proportion of restricted grazing land has a robust negative impact on the quality of other unrestricted grazing resources, although managing the restricted grazing land at the lower village level had a robust positive impact. Population growth has had negative effect on availability, quality and erosion level of grazing lands.

Vandersypen, *et al.* (2006), using descriptive and qualitative analysis, evaluated farmer organizations of water management in Mali focusing on two principal activities of water management: water distribution and maintenance in Mali. For both activities, the rules in use and their ability to resolve possible collective action problem were assessed and the impact of the type of infrastructure on the rules was examined. The results showed that rules are devised only on 30% and 24% of the canals for water distribution and maintenance, respectively. Moreover, there is often no consensus on rules among farmers. Besides, monitoring and sanctioning mechanisms were absent. The study

indicates that with water supply being abundant and the infrastructure recently rehabilitated, organisation of water management at community level is not always required to avoid problems.

In a study in Harayana, India, Kurian & Dietz (2005) employed descriptive analysis to argue that participatory watershed management projects need not necessarily safeguard the interests of poorer rural households. The study was based on a survey and case study evidenced from 28 watershed management groups. They demonstrated that given a particular institutional contract, irrigation service provision by contractors proved to be more effective than provision by a community organisation. It ensures that water allocation, collection of irrigation service fees and routine maintenance of irrigation infrastructure by contractors was more effective than the community. The analysis of benefit distribution reveals that wealthier landholding households benefited more from management of irrigation and forest resources as compared to relatively poorer households. With regard to the distribution of costs arising from watershed management, the researchers found that the workload for women was greater than that of men as a result of the doubling of agricultural yields under irrigation conditions.

In their study in Phillipines, Fujile *et al.* (2005) examined factors affecting the success and failure of collective action for management of local commons in developing economies. They used a case of an irrigation project, based on cross-section survey of irrigators' associations in 25 national irrigation systems under the command of the National Irrigation Administration. They used the Probit and OLS regressions as their analytical tools. The

results were consistent with the hypothesis that collective action by water users for the operation and maintenance of irrigation system is difficult to organise where:

- Water shortage rarely occurs
- The difference in water supply is large between upstream and downstream farmers
- Irrigators' association is large in terms of service area and the number of farmer beneficiaries within its territory
- The local community is sparsely populated, involving low social interactions
- Farm households have the option of ready exit from farm to non-farm economic activities
- Farmers had traditionally practiced rain-fed farming with no previous experience in managing communal irrigation systems.

Another study analysing constraints was carried out by Theesfeld (2000) in Bulgaria's irrigation sector in three different regions, Veliko Tamowo, Pavel Banja and Haskowo. The results of the study reflected that most of the people living in the selected areas were too old and were no more active in agricultural production, with most of them producing at subsistence level. The study also showed that only a few young families wanted to live on agriculture and they had to rely on irrigation for their farm activities. As such, only a small actor group was concerned when discussing changes in operational irrigation rules towards collective action. The attitude towards collective action was pessimistic and there seemed to be no trust among the villagers. Moreover, individualistic behaviour prevailed. The actor's characteristics and the information asymmetry pave way for opportunistic

behaviour. Theesfeld (2000) attempted to show the effect of the following factors on collective action:

- Resource system characteristics
- The resource characteristics
- The actor group characteristics
- The evolving local rules in use
- The effective institutional settings and
- The formal political settings

Meinzen-Dick *et al.* (2000) identified factors that affect organization of water users' associations and collective action by farmers in major canal irrigation system in India. A stratified sample of 48 irrigation outlets in four irrigation systems were used based on qualitative and econometric analysis. The study first examined the conditions under which farmers are likely to form formal or informal associations at the outlet level (serving several watercourses and one or more villages). The results of the study indicate that organizations are more likely to be formed in larger commands, closer to market towns and in sites with religious centres and potential leadership from college graduates and influential persons. Lobbying activities are not more likely where there are organizations, but organizations do increase the likelihood of collective maintenance work.

An investigation in Honduras by Pender & Sherre (1999) on the determinants of local organisational density and the impact of local and external organisations on collective

action and private natural resource management decisions employed an econometric analysis. The survey was based on 48 villagers. The main findings of the study, with regards to the determinants of local organisational development, were that population growth contributes to organisational development at low level of growth. It has, however, diminishing and possibly negative effect at high growth rate. The results also showed that local organisational development was reduced with proximity to urban centres.

The result also indicates that local organizations contribute to collective investment in natural resource management and assist in regulating use of common property resources and dealing with externalities. Local organizations have mixed impact on farmers' private decisions to adopt resource conservation measures, such as no burn practices and ploughing in crop residues. External governmental organizations seem to displace collective investment in natural resource management, though they promote other kinds of collective investment such as construction and maintenance of water systems and roads. External organizations have a stronger impact on promoting adoption of labour-intensive conservation measures (such as no-burn, ploughing in crop residues and terracing) on private cropland.

Bastidas (1999) examined gender issues and women's participation in irrigated agriculture in Carchi, Ecuador, using a combination of qualitative and quantitative methods of analyses. The findings showed that women's participation in water user associations is low, and culture plays a strong role in terms of their decision-making power. In addition,

women tried to solve their irrigation-related problems through informal ways where they had more decision making power.

Makombe *et al.* (1998) evaluated the performance of smallholder irrigation systems in Zimbabwe. They took three smallholder irrigation systems; two from government managed system and one from the community or farmer managed irrigation system. The authors used Production Function Analysis *(to evaluate production efficiency)*, Theil Information Theoretic measure *(to evaluate inequality in the distribution of benefits from irrigation)* and Theil Forecast Error method *(to evaluate management performance)*. The results showed that the farmer managed irrigation system performed better consistently than the government managed irrigation system in production, distribution and management performance.

A study by Shimelis (2006) evaluated the institutional and management practices of small scale irrigation systems in Ethiopia. The result shows that the irrigation systems were poorly managed in terms of water allocation and distribution, conflict management and system maintenance, because of lack of well-established organizational and institutional conditions. The water user associations are not well organized and found to be weak to run the irrigation systems. Users have problematic social relation. Clearly defined and well-enforced land and water rights are non-existent at the operational level. Regarding technical resources such as improved seed that is adaptive to the situation of irrigation, labour and knowledge of irrigated agriculture (extension service and capacity building for irrigators) have not been met in the two irrigation systems.

A qualitative approach research by Zalake (2006) to examine water rights and the process of negotiations among irrigators was carried out along Indris modern scheme in Toke Kutaye district, West Shoa zone, Ethiopia. The findings of the research depicted that Indris scheme marked three different significant phases in its historical development. In these phases, exploration pertaining to water rights and processes of negotiations were found to be at their immature ground. Multiple water right rules emanating both from the customary and formal water acts have co-existed to direct the actions of users.

In this regard, the theoretical orientations of pluralism in water right paradigms proved to coincide with the programmatic context of water users from the scheme. Furthermore, the main reasons for conflict occurrence in connection to irrigation water use and rights are decline in the volume of water resource, institutional failures to address the causes adequately, week observance on governing water right rules and increasing demands of users. As a result, negotiation process aiming to settle disputes was repeatedly initiated either by users, committee members (elder) or courts. Given the above past studies, the following sections therefore presents a methodological review on past methods that other authors have used in an attempt to evaluate the effectiveness of institutions in the management of resources.

In Sri Lanka, a study by Gulati (2002) revealed that there were many problems in agency managed irrigation. Poor maintenance of irrigation facilities under public provision is a salient feature in many countries. Sri Lanka spent less than 10 percent of total expenditure on maintenance during 1950-88 (Aluvihare & Kikuchi, 1991). China lost almost 1 million

hectares due to poor maintenance since the 1980s. Some 36.6 percent of the irrigated areas in Pakistan are waterlogged. The decline in the availability of suitable land for irrigated agriculture, extremely high costs of developing irrigation infrastructure, increased operation and maintenance costs, poor cost recovery are the major features of the early period of irrigation development which are run mostly by government (Gulati *et al.*, 1995, Rosegrant, 2002). There was heavy subsidisation of the irrigation management in Sri Lanka which had a poor record of cost recovery. Less than 50 percent of the maintenance costs have been collected from farmers at any time (Herath, 2002). In India, Pakistan, Bangladesh, Philippines, and Indonesia, irrigation user fees are 10-90 percent less than the cost of operation and maintenance. The cost to the farmers varied between 5-15 percent of the operating costs. The World Bank found that in seventeen irrigation schemes it examined, less than 30 percent of the total costs were recovered through pricing or other fees (Sampath, 1992). There has been a several fold increase in the irrigation subsidies. This suggests a situation where water resources will not be effectively managed and this study seeks to evaluate how institutions can be effective in the management of water resources.

In addition, as observed by Rosegrant *et al.* (1995), another major deficiency has been the wrong pricing policies in irrigation. Pricing is not related to the scarcity or the cost of delivery. The charges were fixed in nominal terms and hence the real price of irrigation is very low. A flat rate pricing means the marginal cost is zero which created inefficiency in water use. Efficiency in developing country projects is typically 25 to 30 percent, compared with 40 to 45 percent under best practice (World Development, 1994). It is therefore the

objective of this study to understand how favourable policies can be formulated and effectively implemented to allow for effective irrigation water resources management.

In India and Pakistan, (Shah, 1993 & Meinzen-Dick, 1998) identified that there can be monopoly elements in the water market, especially for groundwater. However, Sri Lanka's ground water development differs from those of India and Pakistan in two significant ways, with implications for water market development (Kikuchi et al., 2003). In Sri Lanka, ground water developed spontaneously and had only informal social institutions with little legal environment or regulation. There is no sale of ground water from wells by Sri Lankan farmers. This research study seeks to evaluate the effectiveness on informal institutions and how they can be used in harmony for effective irrigation water management.

A study of the Ban Vuen-Tonhen WUA in Savannakhet Province of Laos provides useful results on the equity impact and the ability to pay the irrigation fee after IMT (Rasphone *et al.,* 2006). This is one of the nine pilot IMT programs in Laos. The study shows that after IMT, farmers who switched over to more lucrative crops such as chillies, peanuts and tobacco obtained significant increase in incomes and were able to pay the irrigation fee. But rice cultivation has been found to be unprofitable. In two WUAs where subsistence farmers dominated, rice was a main crop and many farmers failed to pay the irrigation fee. Overall, the performance of these WUAs has been rated outstanding. They had a long history of farmer-managed irrigation using water from the Mekong River where electric pumps supply water to the command area. The study also seeks to evaluate the

effectiveness on water institutions to allow for users paying for water use for effective water management.

4.5 A methodological review

A methodological review is crucial as it provides a background and set contrast for the research methodology to be used in the current study. As such, it is therefore critical to start by reviewing existing studies in the institutional literature that attempt to empirically evaluate the issues of institutional interaction in a given situation. The focus of this review will be mainly based on three aspects;

- The dimensions or scope of the institutional performance, both from a formal and informal institution point of view
- The nature of variables developed to capture institutional aspects, and
- The methodological framework and evaluation context used by existing studies

Wallis & North (1986 & 1988) employed a temporal analysis to study the size, structure and implications of the “transaction sector” (i.e. the institutional structures and facilitate, enforce and maintain economic exchanges within the market setting) in the US during the 1870-1970 period. Further to that, Adelman & Morris (1974), combined both temporal and cross-section analysis to study the impact of political structures and economic institutions on economic growth in the context of 23 countries during 1850-1914.

However, the study by Adelman & Lohmoller (1994) evaluated the institution-performance interaction within a quantitative framework using a latent variable regression model or unobservable institutional variables captured by their relationship with observable variables. In the analysis, most of the latent variables (e.g. the character of the national political leadership, favourableness of land institutions to improvements and the spread of technology in different sectors) have also been formulated as categorical variables with categories based either on actual evidence or on *a priori* reasoning.

A combination of temporal and cross-sectional analysis has also been used for studying both general as well as specific aspects of institution-performance interaction. One such analysis was done in a study by Remmer (1988) who used this hybrid approach to evaluate the relationship between democracy and international cooperation in the Mercosur region (comprising Argentina, Brazil, Paraguay and Uruguay) during 1947-1985. While the observed economic and international treaty, data are combined to quantitatively evaluate the democracy-cooperation linkages within a logit regression framework, the main dichotomous variable, i.e. democracy, has been created using secondary information from a comparative research on Latin American democracy.

Both the general and specific aspects of the linkages between water institutions and water sector performance have been recognised widely, either within a theoretical, subjective, or case study framework (e.g. Hartman & Seastone, 1970; Dinar & Latey, 1991; Frederiksen, 1992; Guggenheim, 1992, Le Moigne, *et al,* 1992 & 1994); Gazmuri & Rosegrant, 1994; Hearne & Easter, 1997; Howitt, 1998). The scope, purpose and methodologies of these

differed; however, their common element binding them was their focus on the performance implications of one or more aspects of water allocation and management institutions.

However, there is hardly any study attempting to evaluate the issues of irrigation institution-performance interactions or linkages (formal and informal), within the irrigation water sector and the present research study attempts to evaluate institutional effectiveness for such a perspective. Some studies have attempted to evaluate some of the aspects of institution-performance interactions within the water sector using different evaluation contexts and methodologies.

A study by Wade (1982) compared the yield and employment performances of irrigation water control institutions (i.e. water distribution system and allocation procedure) in Southern India with that in Korea within an essentially descriptive and non-quantitative framework. The better performance of Korea is explained in terms of a better water supply, small, decentralised and demand-controlled system and good management structure. Another study by Lo & Tang (1994) in China utilised a case study framework of descriptive nature to explain the differential performance of institutional arrangements (governance and management structures) in controlling water pollution from different sources (industrial and domestic). Their main findings were that; since no one set of institutional arrangements can solve all types of collective problems, a better institutional performance can be ensured only by designing them to be compatible with the type of problem they confront.

There are also some studies (Rausser & Zusman, 1991; Yang, 1997) that specifically consider the role of the context within which the institution-performance interaction occurs. Rausser & Zusman (1991) provides a theoretical model that considers the political, economic and physical aspects of the water systems as parts of a co-evolutionary process. Similarly, Yang (1997), describes the way water institution, resource system and competing economic and social interests interact and co-evolve over time.

4.6 Analytical and empirical frameworks for the study

4.6.1 Evaluating institutional effectiveness

The use of resources in common and the negative consequences on the environment are widely addressed in the literature. From Hardin's (1968) famous article, this problem has become well-known as the "tragedy of the commons". Ostrom (1990) underlines the existence of the free-rider problem with respect to the commonly used resources. In order to solve these problems, some researchers have put forward some arguments for state intervention, while others favoured the introduction of private property rights.

However, institutional effectiveness cannot be simply attributed to the existence of private or public institutions, neither to those of formal or informal institutional arrangements. Rather, the institutions should find the state where they can function with the lowest transaction costs, by combining both the formal institutions with the informal ones. As such, they should adapt to the already existent institutional setting, and improve it by finding the most efficient-lowest cost equilibrium.

Measuring the institutional performance is in itself questionable, since it refers to the quantification of the performance of rules, norms of behaviour and traditions. And the question that arises is how rules or norms of behaviour can perform. Moreover, it is not the institutions that perform, but their presence influences the performance and efficiency of natural resource management. Thus institutions can be evaluated only in an indirect way, by analysing their impact on the state of the water sector, on water management and thus on the well-being of the target groups. In addition, the presence of some characteristics in an institutional setting, which, in other examples brought about successful water management, could be considered as an indicator of performance. This study therefore seeks to evaluate the effectiveness of both the formal and informal institutions on water management and their overall well-being. This is also based on the fact that the water reforms in Zimbabwe also addressed the well-being of the colonially oppressed with regards to access to water resources. The question that the thesis attempts to answer is whether irrigation institutions are really effective in water resources management, especially for enhanced welfare of the water users and the nation at large.

However, Balint, *et al* (2002) argues that the latter approach is again questionable, since, however, some institutional arrangements perform well in one country or region; there are several factors that are not counted for, which influence the efficiency of these institutions in the respective setting. The uncounted factors are the overall socio-economic and political environment as well as the informal institutions. Thus one institutional setting successful in one case may fail in the other.

On this basis, the analytical framework of the research study will involve three steps. Firstly, the concepts of *irrigation water sector, irrigation water institution and irrigation water sector performance* are defined to set a broad contour of analysis. Secondly, water institution and water sector performance are conceptually decomposed to identify some of their major components and sub-components (or aspects or facets). Finally, the decomposition exercise will be used as a basis to analytically highlight various layers of institutional inter-linkages and institution-performance linkages. The research study will focus on both the indicators of formal and those of non-formal institutional performance.

4.6.2 Water sector and water institution: Conceptual basis

Consistent with the institutional economics literature, (Bromley, 1992; North, 1990) in Saleth & Dinar (1999) state that institution is conceived in a much broader sense than a mere organisation. Their argument is that since institutions set the rules of the game and define, thereby, what individuals can and cannot do in given scenario, they, in effect, delineate the action sets for both individual and collective decision-making. They go on to highlight that institutions are influenced by a variety of factors such as historical precedents, constitutional provisions, political arrangements, demographic conditions, resource endowment and economic development. Such an analytical framework will be applicable for this study within the Zimbabwean context, given that the country has gone through a series of socio-economic and political transformations (land reforms programmes, water reforms *(Chapter 2)*, political page, among other reforms). As such,

applying such an analytical framework will expose how the formal and informal institutions have oriented themselves to these reforms and the extent to which they are effective.

Since the influence of these factors is formalised into three inter-related aspects; legal frameworks, policy issues and administrative arrangements, institutions can be conceptualised as an entity defined interactively by three main components; *law, policy and administration.* Specialising such a general notion of institution to the particular context of irrigation water sector, irrigation water institution can be characterised in terms of irrigation water law, irrigation water policy and irrigation water administration (Figure 6.2 below). However, this study seeks to include informal counterparts (e.g. conventions, customs and administrative traditions) to try and establish how these can be used together in a given context (in this case, irrigation water management) to enhance their mandate in line with the intended water management objectives. In addition, the study seeks to explore the effectiveness and nature of linkages that exists between these types of institutions.

In this study, the IDA for measuring the effectiveness of irrigation water management institutions was done in two stages as has been employed by Saleth & Dinar (1999). Firstly, the irrigation water institution was decomposed not into three (as by Saleth & Dinar), but into four broad institutional components; irrigation water law, irrigation water policy irrigation water administration *(formal)*, and the informal institutions. Each of these institutional facets was decomposed further to identify its institutional aspects. From a policy perspective, the institutional aspects that will be under consideration in the research

study, under each major component are presented in the conceptual framework in Figure 4.2 below:

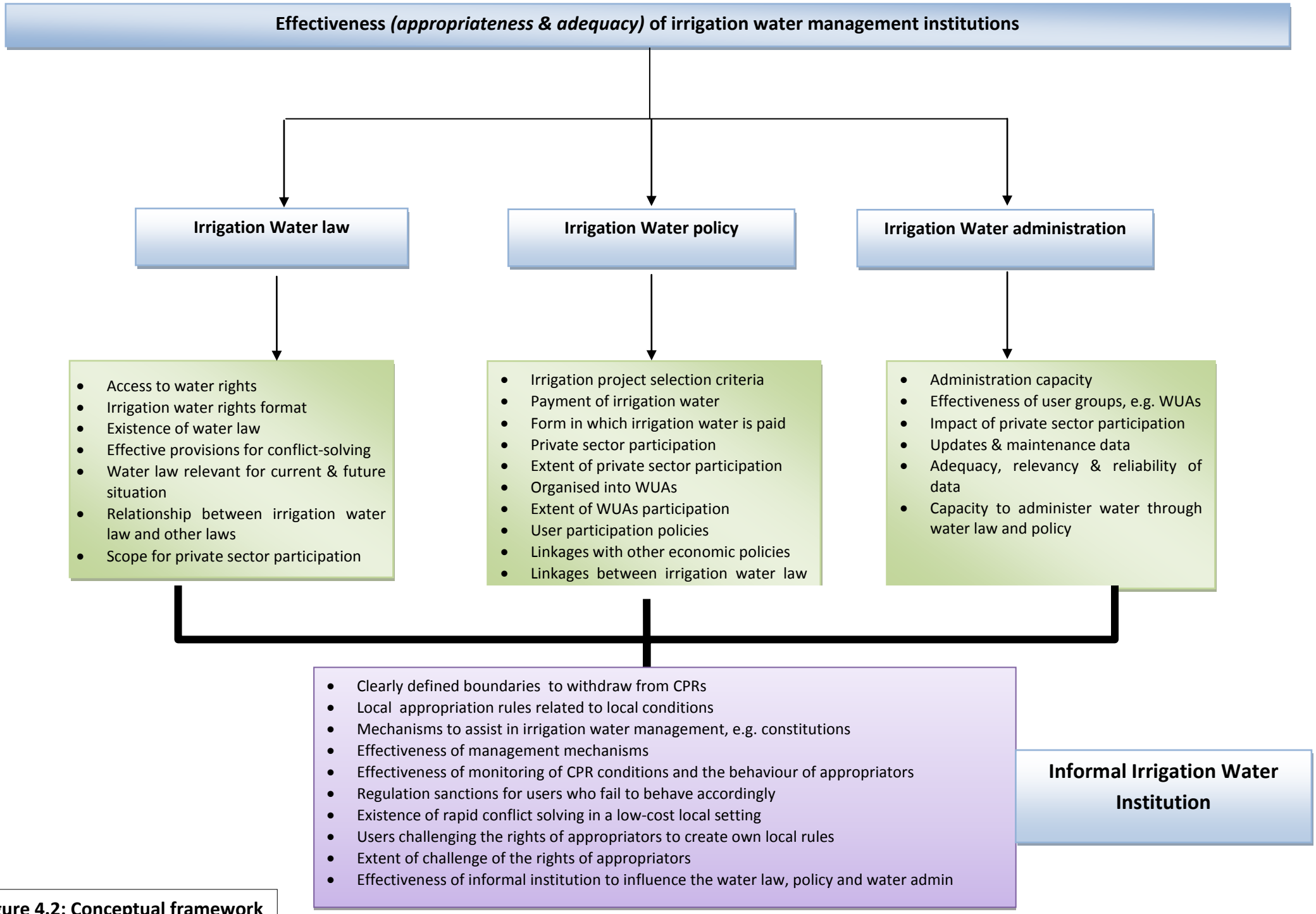


Figure 4.2: Conceptual framework

4.6.3 The Institutional Decomposition Analysis (IDA)

Saleth and Dinar (1999) have a quite comprehensive and applicable approach to evaluating institutional performance. They attempt to quantify institutional performance through effectiveness of the elements of institutions, the inter-linkages between these components and the inter-linkage between institutions and water sector performance. However, in their exercise, they focussed mainly on formal institutions, yet the informal institutions like conventions, customs and norms of behaviour were left out of their analysis (a gap that this study seeks to close).

To analyse the effectiveness of the institutions, Saleth and Dinar (1999) decomposed them into their constituent components and the constituent components further into the aspects of the components. They approached the indicators through individual and interactive effect of the components of institutions on institutional performance, as well as through the impact of the socio-economic, political and resource related environment in which they function.

In Saleth and Dinar (1999) analysis, the following components of institutions were considered: law, policy and administration. Applying this approach on the specific case of water management institutions, they defined them in terms of water law, water policy and water administration. To enable them to evaluate the effectiveness of each component, they took into consideration the aspects that are within each and the strength of linkages to other components. They developed the indicators not only on the basis of their ability to

reflect the “performance” of given component or aspect, but also depending on the possibility to translate it into a numerical way.

4.6.4 Evaluation indicators of informal institutions

Ostrom (2008) discussed about the conditions the common-pool resource (CPR) institutions have to fulfil in order to exist for a long time and to be efficient. These conditions can be valid for formal institutions as well. But because of their self-governance characteristic, they were considered under the informal institutional indicators. Moreover there is one condition that underlines the informal nature of these institutions, that of the recognition of the right of self-organisation by external governmental authorities. According to Ostrom (2008), the conditions presented below are indicators in a sense that their existence shows a viable institution, while their absence underlines non-performance.

The conditions of Ostrom are listed below.

- Clearly defined boundaries for both the individuals / households to withdraw resource units from CPR and the CPR itself.
- The appropriation rules should be related to local conditions: they can restrict the time, technology, place or quantity of resource units based on the local aspects.
- Most individuals influenced by the rules of operation can participate in modifying these rules.

- The monitoring, the auditing of CPR conditions and that of the behaviour of appropriators, should be accountable to the appropriators, and even appropriators can perform them. This is a low cost exercise, since observing the behaviour of the other appropriators in a small community is relatively easy and at the same time it leads also to information transparency, by obtaining information on compliance rate.
- Those appropriators who violate the operational rules receive graduate sanctions from the appropriators and/or from the officials accountable to the appropriators.
- Appropriators and officials have rapid access to conflict solving in the low-cost, local setting.
- External governmental authorities do not challenge the rights of appropriators to create their own institutions.

It was therefore believed that if these preconditions existed, the CPR institutions would contribute to the lowering of the transaction costs, since the time and costs allocated to monitoring, enforcement, and to obtaining information are all lower than in a formal institutional setting. Therefore the formal institutions should rely on the informal arrangements, provide them the framework to function and only interfere when necessary. As discussed in Chapter 3, water is regarded as a CPR, as such; this study adopts the above discussed conditions as they, in one way or the other, can determine how water users can decide to manage irrigation water within their given setting.

A more applicable, more operational method than the conditions presented above is the empirical evaluation of small-town water supply management done by Deutsche

Gesellschaft für Technische Zusammenarbeit (GTZ) (1996) for the assessment of water supply systems in the Volta Region of Ghana. This method used the following indicators: water supply situation, sustainability and external factors. Each indicator had scores for evaluation of institutional performance.

The *water supply situation indicator* assesses the extent to which the community needs an improved water supply, and how much preparation and capacity it has to improve the water supply by itself. Therefore the indicator was composed of aspects like: need; responsibility; sense of ownership of the water supply facility; willingness to pay for an improved water supply; ability to pay on the basis of the average income; and extent of participation in the past in initiation and implementation of water supply projects. This indicator had a weight of 45% of the total score.

The *sustainability indicator* comprised those indicators which showed the community's capacity of planning, organising and managing the activities in a sustainable manner. This indicator represented 40% of the score grid. The indicator measured the following aspects: the number, variety and effectiveness of community organisations; the extent of community leadership, unity and coherence; the extent of independent organisation of women groups and their planning development efforts; the extent to which the community had already developed experience in any sector, those without outside assistance and those initiated from outside the community; development potential, measured by the extent and variety of commercial activities, and the existence and variety of skills within a community.

Finally, the *external factors indicator* considered the external factors that could increase or diminish the importance of a community. This indicator represented 15% of the score. It comprised: the political status, evaluated based on aspects of being a district capital or otherwise, home town of an important politician or not and the communities' interest in having a state agency, therefore a formal organization for water supply.

The above GTZ methodology could indirectly assess the level of satisfaction of the population. This aspect is important in order to analyse efficiently the institutional performance in the transition process of the water system towards the water market.

Based on the above review, the research methodology for the study will be, to a larger extent, benchmarked on the above approaches. While the above approaches were limited to evaluation approaches based on the formal institutional methods of analysis, this research study seeks to evaluate both the formal and informal irrigation water management institutions and explore the effectiveness, relationship and the existing inter-linkages between them. Also important is how they can both contribute to developing effective irrigation water management institutions that would manage water resources at the lowest possible transaction costs. In this light, both the formal and informal institutions will be decomposed into their respective components that will define them and will be evaluated upon to assess their effectiveness in water management.

4.6.5 Evaluation of irrigation water sector performance

Besides the institutional aspects as outlined above, there is also a need for a set of *performance aspects* that will capture the overall effectiveness or performance of not only each of the four institutional components, but also irrigation water institution as whole. These aspects to be considered are as follows:

- Overall effectiveness of the irrigation water law
- Overall effectiveness of irrigation water policy
- Overall effectiveness of irrigation water administration,
- Overall effectiveness of the irrigation informal institutions, and
- Overall effectiveness of the irrigation informal institution on formal institutions

It is also important to take note that each institutional component depends not only on the effectiveness of its institutional aspects, but also on the strength of its linkages with the other institutional components. Moreover, the direct impact of the institutional components and their underlying institutional aspects, the performance of the irrigation water institution is also influenced by the general socio-economic, political and resource related environment within which it operates.

Saleth & Dinar (1999), however, noted that although it is relatively difficult to conceive and measure the overall performance of the water institution compared with that of its components, it is possible to capture it indirectly in terms of the progressiveness of water

institution. In this analysis, Saleth & Dinar (1999) used the *indicator of progressiveness or the overall adaptive capacity of water institution as a whole.* Aspects considered included; adaptive capacity, scope for innovation, openness for change and the ability of the institutions to handle/tackle emerging or future water challenges.

Adaptive capacity is taken to be indicative of the flexible nature of water institution to change with time and space, while the scope for innovation allows the institution to acquire new and more appropriate institutional structure and get itself updated constantly. Similarly, openness for change suggests the absence of institutional rigidity within the water institution and the ability to tackle emerging problems indicates its performance efficiency even with changing resource realities within water sector.

Given the political, socio-economic transformations and reforms in Zimbabwe over time, the above approach was also be employed within this context and attempt to see how irrigation institutions have also evolved with time and how they have aligned themselves to a changing environment. Given the decomposition of irrigation water institutions and its performance as outlined and proposed above, it is therefore possible to link, both analytically and functionally, the performance of each institutional component with their constituent aspects. Similarly, the overall performance of irrigation water institution can also be linked with the performance of institutional components and also with the institutional aspects themselves. In this way, the analytical decomposition outlined above provided a framework for evaluating both the institutional inter-linkages as well as irrigation institution-performance linkages within the irrigation water sector.

In addition, Bandaragoda (2000) offered a slightly modified approach to institutional analysis. The analysis focused on institutional change, the possibilities of improvement of institutions in a river basin context and suggested that institutions of water management should be evaluated in the historical context, comparing them with the physical development of the basin. Furthermore those aspects of current policies, laws, organisational arrangements should be identified, which are to be improved. The adequacy and appropriateness of the key components is to be assessed.

The current research study focuses on irrigation institutions and these will also be evaluated based in the historical context as the conditions that existed then have changed over time, with new settings under new water users in the form of A1, A2 and small-scale indigenous farmers. As such, formal and informal conditions that need to be improved and/or changed should therefore be identified, their appropriateness and adequacy assessed within a given context, e.g. in this case, in a now 'independent' Zimbabwe that has been under oppression historically.

The components and aspects Bandaragoda (2000) considered are those defined above by Saleth & Dinar (1999). According to this consideration, the adequacy and appropriateness of the institutions can be evaluated on the basis of the following questions (within the study context):

- To what extent is the institutional aspect adequate for the current system?
- Does it match the water availability and quality aspects?

- Is it adequate and appropriate for the physical infrastructure, for the existent socio-economic situation, for the current technology and for the current performance level?

Furthermore, another possibility of institutional evaluation could be based on arguments by North (1990). The argument North (1990) put forward was that; together with technology, institutions determine the production and transformation costs. Therefore, institutional performance could be approached in a way that lower transaction costs and show a better institutional performance. And in order to achieve lower transaction costs, it is essential that the formal institutions build on the informal institutions existent already with respect to the management of natural resources. This way, the monitoring, enforcement and other costs can be significantly reduced. As such, an evaluation methodology, based on the above arguments is discussed in the subsequent section.

4.7 Conclusion

Institutions in a broad sense are a set of humanly devised constraints and rules that govern and limit human behaviour and interaction and these can include legal rules, organisational forms, and norms of behaviour and enforcement mechanisms. Institutional change shapes the way societies evolve through time and it is the key to understand historical changes. The major role of institutions in a society is to reduce uncertainty by establishing a table structure to human interaction.

Various studies have shown that institutions can be used in the management of common pool resources. However, management practices can vary from one societal setting to another. The studies reviewed have shown that collective action in the management of resources functions well, but however, in some cases, Water Users Associations have managed water resources poorly and this was attributed to support services being minimal, lack of market-oriented production, conflict resolution was not done at local level (by-laws were not enforced), lack of consensus among farmers resulting in lack of monitoring and sanctioning at some irrigation schemes.

In addition to the above challenges, collective action has been found to be difficult to organise where there is; lack of defined and well-enforced property rights, large difference in water supply between upstream and downstream farmers, large irrigators' association in terms of service area and the number of farmer beneficiaries within its territory, the local community is sparsely populated, involving low social interactions, farm households have the option of ready exit from farm to non-farm economic activities and where farmers had traditionally practiced rain-fed farming with no previous experience in managing communal irrigation systems.

In addition, the discussion has revealed the importance of the following factors as either constraints or enabling situations affecting overall irrigation water resources management; the political system, national policies, legal framework and the socio-economic environment. A number of studies have attempted to review the effectiveness of institutions in the management of resources, including water resources. In addition, some

of these studies have also explored the institution-performance interactions between the institutions in the management of natural resources. However, hardly any study has attempted to employ a methodological framework in trying to evaluate the issues of institution-performance linkages between the formal and informal institutions in the management of resources, particularly water resources.

It is against the above that the research study seeks to find ways of integrating the formal and informal institutions for the best water management practices at the lowest cost possible.

CHAPTER 5 – METHODOLOGY

5.0 Introduction

This chapter describes study area. The discussion is presented at both national and provincial level. At national level, the description includes a presentation on the climate and geography of Zimbabwe, water bodies, tenure and water management issues. The legal and institutional environment for water resources development and management is also discussed in the chapter. The discussion also includes water reforms and trends in water use and management. At provincial level, the description centres on the population of the province. The distribution of the irrigated area before and after the FTLRP, both nationally and provincially is also presented in this chapter. This chapter also discusses the methodology that was used in the research study, based on the review of the analytical framework from various studies and the proposed analytical framework for the study (chapter 4). Also discussed are methods of data collection, data analysis and the limitations of the research study.

5.1 Description of study area

5.1.1 Zimbabwe: Climate and geography

The research study is proposed to be carried-out in Mashonaland East Province, Zimbabwe. Located in South-Eastern Africa, the Republic of Zimbabwe is a landlocked country bordered by Botswana to the South-West, Mozambique to the East, Zambia to the

North-West, and South Africa to the South. Along the border with Mozambique are the East African Highlands, a mountain range that features a cool, wet climate. The Zambezi River is found along the border with Zambia and contains the majestic Victoria Falls, the world's largest waterfall. A high, rocky plateau traverses much of the centre of the country, while lower plateaus and grasslands can be found in the west. The country's natural resources include coal, gold, nickel, copper, iron ore, lithium, tin, and platinum.

Zimbabwe is divided into five broad Natural Regions (NR) in which the dominant natural factor conditioning agricultural production is climate; mainly rainfall. They are also based on soil types. The five agro-ecological zones; regions I to V reflect the range from high-to-low quality land. The rainfall patterns and crop production progressively deteriorate from Region I to Region V. The map below shows the 8 provinces of Zimbabwe.

Administratively the country is divided into ten provinces (FAO, 2001), including Harare and Bulawayo as shown in Figures 5.1. Harare and Bulawayo provinces are made up of an urban population only. A high plateau dominates the country with a ridge forming a central backbone. Harare is the capital city and other major urban areas are Bulawayo, Chitungwiza, Gweru and Mutare.

The country enjoys a subtropical climate with four overlapping seasons, but according to FAO (2001), Zimbabwe's climate is more on the temperate side due to the high altitude of the central plateau. The average daily temperature in winter ranges from 13^0C to 23^0C and in the summer from 25^0C to 30^0C. Rainfall is highest in the Eastern Highlands

(Manicaland) and on the plateau, which receives about 1000 mm per year, while annual rainfall in the Lowveld region is often below 400 mm per annum (FAO, 2001).

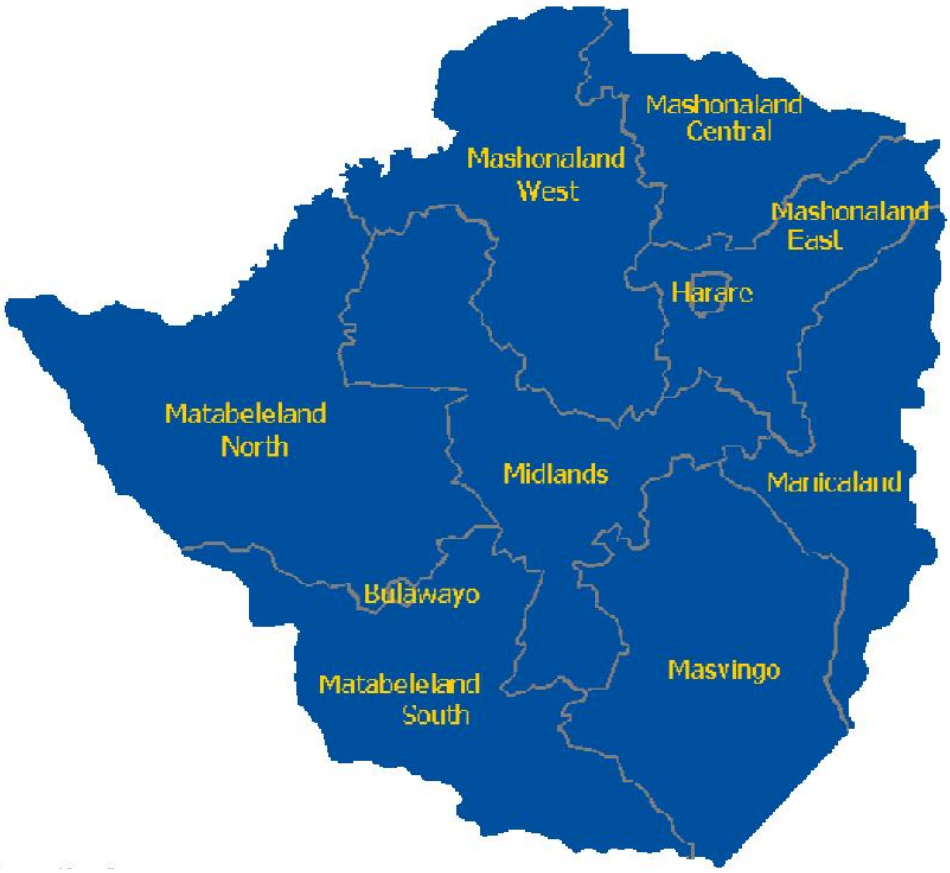


Figure 5.1: Provinces of Zimbabwe

Source: Mushunje (2006)

5.1.2 Water Bodies and Resources

Zimbabwe is bordered by the Zambezi River to the North and by the Limpopo River to the South. Both rivers flow into Mozambique and are fed by Zimbabwe's internal river systems. Zimbabwe's seven major rivers flow into seven river catchments: the Save,

Runde, Mzingwane, Gwayi, Sanyati, Manyame, and Mazowe. Reservoirs have been and are being developed to better exploit the country's water resources. Zimbabwe's major reservoir capacity comes from Lake Kariba, which the country shares with Zambia. The country's irrigation potential draws primarily on these surface water resources.

Zimbabwe has total annual internal renewable water resources of 12.26 cubic kilometres: 11.26 cubic kilometres are surface water resources and 6 cubic kilometres are groundwater, with an estimated 5 cubic kilometre overlap between the two sources (FAO, 2008). The country has an average annual rainfall of 657 millimetres, but rainfall can range from over 1000 to only 300 to 450 millimetres, depending on location. Rainfall figures decrease steadily across the country from north to south and also from east to west. Thirty-seven percent of the country can sustain rain-fed agriculture, while the remainder is dependent on supplemental or full-time irrigation.

In 2002, total water withdrawal in Zimbabwe was approximately 4.2 cubic kilometres (FAO, 2008). Seventy-nine percent of this water was used for agriculture, including irrigation, fish-farming and livestock. Zimbabwe has an estimated 550,000 hectares that are irrigable, but irrigation systems have been developed for only 200,000 hectares. Of the developed systems, many have deteriorated or been destroyed in the years of conflict related to land reform efforts (Utete, 2003).

5.1.3 Tenure Issues

Under formal law, the state owns all surface and groundwater in Zimbabwe. All Zimbabweans have the right to water for primary (domestic) use while other uses require state approval. Water rights are managed by Catchment Councils, which can issue permits for water use for agriculture and industry. Permits are typically valid for 12 years and are renewable. Payments are made based on the volume of water used, and permits transfer with the sale of land.

Under customary law, the population has the right to use water for all traditional purposes, without obtaining a permit or making any payment. Zimbabweans have a long history of managing water resources at local levels, including establishing practices governing hand-dug wells, springs, and boreholes. In some areas, a water source on private homesteads may be considered a public resource.

5.1.4 Legal and Institutional Environment

5.1.4.1 Legal Framework

The **Environment Management Act (2002)** provides the legal foundation for the sustainable management of natural resources (including water), prevention of pollution and environmental degradation, preparation of national and other environmental management plans, and custodianship of the country's environmental impact assessment

policy. The Act provides for an Environmental Management Agency that has the power to advise on, plan, and regulate matters of environment.

Under customary law, Zimbabwe's water belongs to the land. All residents have the right to use water resources for domestic needs, irrigation, watering livestock, and for use in activities such as brick-making. Under customary law, water use is governed by local water-point committees, or, in their absence, chiefs, headmen, or village assemblies. These traditional bodies continue to exercise authority over water resources in many areas.

Zimbabwe does not have a national irrigation policy. National objectives for agriculture, including irrigation, are captured in Zimbabwe's Agricultural Policy Framework (ZAPF), which is effective for the 1995 – 2020 period. Policy objectives include: increases in irrigated areas, primarily targeting smallholders; equitable and efficient allocation of water resources; creation of water-pricing structures based on cost and "social efficiency;" establishment of improved institutional structures; and implementation of drought mitigation plans.

5.1.4.2 Institutional Framework

The Ministry of Water Resources and Development (MWRD), establishes policies on water resource development. Several departments and parastatal agencies under MWRD are involved in irrigation and water: the Department of Water Development, ZINWA, and

the District Development Fund. ZINWA advises the Minister on the formulation of national water policies and standards and, in conjunction with Catchment Councils, is responsible for the planning, coordination and management of national water resources and delivery. There are seven Catchment Councils, which represent all stakeholders in their catchment areas including both smallholders and large commercial operators. Catchment Councils and Sub-Councils prepare plans for the development and utilization of the water resources in their areas, create inventories, and develop water-development proposals in line with the inventory of resources.

The Ministry of Agriculture, Irrigation and Mechanisation (MAIM), is responsible for agriculture and irrigation policy- development and implementation. Departments and parastatal agencies involved in irrigation under the control of MAIM include the Department of Agricultural Research and Extension (AREX), the Agricultural and Rural Development Authority (ARDA), the Grain Marketing Board (GMB), and the Department of Irrigation (DoI).

The **Ministry of Local Government, Public Works and National Housing** oversees smallholder irrigation development. The Ministry of Finance and Economic Development manages financial resources for irrigation development.

Customary law provides that local bodies such as **water-point committees and village councils**, or **traditional leaders such as chiefs and headmen**, have authority to manage the community's water resources. Community sanctions ensure compliance with

established rules. In many areas, the traditional bodies continue to govern issues of day-to-day water access and use, with water-point committees reporting in some cases to Catchment Councils or sub-Councils.

5.1.5 Government Reforms and Interventions

The Water Act and the Zimbabwe National Water Authority Act are the culmination of Zimbabwe's overhaul of the legislative framework for the water sector. In the last decades, the government has indicated its support for large- and medium-scale dam projects and irrigation development designed to support small farmers, although it has often relied almost entirely on donor funding for execution of projects.

The Zimbabwe's Agricultural Policy Framework (1995–2020) includes the following objectives:

- Growth in the irrigated area (particularly in the smallholder sector) with minimal negative impacts on the environment and human health;
- Equitable allocation and efficient use of scarce water resources;
- Establishment of a water- pricing structure that is consistent with cost and social efficiency;
- Establishment of an effective institutional structure; and
- Implementation of drought-mitigating strategies.

The Government of Zimbabwe's 2003 National Economic Recovery Programme (NERP) singles out irrigation as the most important and necessary requirement for agricultural development given the country's vulnerability to drought and the high risks associated with rain-fed agriculture. The broad strategy and policy objectives in the irrigation subsector aim to:

- Contribute to poverty alleviation by targeting resource-poor smallholder farmers with an aim to increasing farm incomes;
- Increase agricultural production and enhance food security at the household level by ensuring some crop production during droughts and dry seasons;
- Extend cropping opportunities and provide a wider variety of crops in both wet and dry seasons to improve nutritional status;
- Create an enabling environment for irrigated agriculture by facilitating and encouraging the private sector to invest in irrigation development;
- Enhance human capacity for irrigated agriculture in the public, parastatal and private sector; and
- Create a spirit of business culture in the smallholder farmers

5.1.6 Trends in Water Use, Management and Sanitation

In recent years, drought has strained farmers and pastoralists, and the land reform and resettlement program has created an increased need for the development of irrigation systems for smallholders. Zimbabwe has well-developed dams, but they have not been

fully exploited. Beginning in the 1990's the government recognized the need for a new framework governing water resources, and the importance of providing irrigation for smallholders in order to increase agricultural productivity.

5.1.7 Challenges and Opportunities

Industry, human waste, and agriculture practices have polluted Zimbabwe's water sources. Deep wells and boreholes are often subjected to chemical contamination, while shallow wells are vulnerable to bacteriological and physical contamination. People living downstream are particularly affected. The crisis in Zimbabwe has also resulted in the deterioration of urban water and sanitation systems, leading to serious cholera outbreaks.

Donors providing water and sanitation support to Zimbabwe include USAID in conjunction with the Office of U.S. Foreign Disaster Assistance (OFDA), the European Commission (EC), the United Nations Childrens' Fund (UNICEF), the Department for International Development (DFID), New Zealand Aid, the Swedish International Development Cooperation Agency (SIDA), the German Government and others. The FAO, the International Fund for Agricultural Development (IFAD), New Partnership for Africa's Development (NEPAD), the European Union (EU), the Japan International Cooperation Agency (JICA) and other partners have joined in a 5-year (2010–2015), US$ 900-million project to develop and rehabilitate Zimbabwe's irrigation systems and institutions. The project follows on and expands and deepens the FAO's US$ 5.9 million project providing agricultural inputs, including irrigation to smallholders, which ended in 2009.

The United Nations Water Sanitation and Hygiene (WASH) cluster focuses on coordinating efforts in water sanitation and hygiene with the goal of halting and containing cholera outbreaks. The International Federation of Red Cross and Red Crescent Societies (IFRC) and the Zimbabwean Red Cross Society have undertaken projects to rehabilitate water points, assist in the formation of water-point committees, and provide community training on sanitation.

5.2 Mashonaland East Province: description

This research study, as discussed in Chapter 1, is confined to Mashonaland East province in Zimbabwe. In light of this, it is important to present a brief description of the province as highlighted in section 5.0 of this chapter.

The population of Mashonaland East province was 1,125,355[11] in 2002 and a population density of 34.9 people/km^2. Marondera is the capital of the province. Mashonaland East has a total land area of 3,222,300 hectares which comprise of four Natural Regions – IIa, IIb, III and IV and is suitable for intensive crop farming, dairy, horticulture and the production of small grains. The province has nine administrative districts viz: Chikomba, Goromonzi, Marondera, Mudzi, Murewa, Mutoko, Uzumba-Maramba-Pfungwe (UMP), Seke and Wedza (Figure 5.2). Three of the districts (Mutoko, Mudzi and UMP) had no commercial farms.

[11] *Central statistical office (2002)*

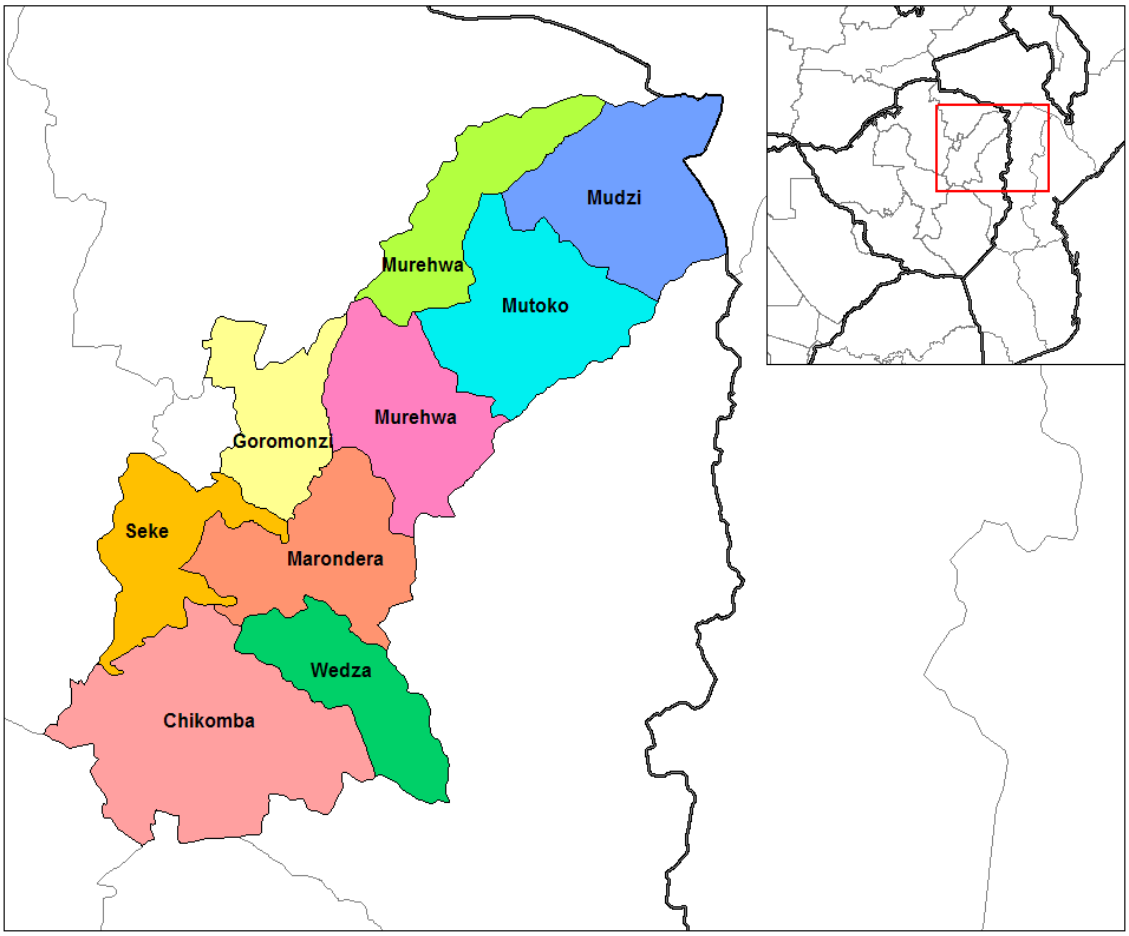


Figure 5.2: Mashonaland East province[12] and its 9 districts

The Government of Zimbabwe launched a national Fast Track Land Resettlement Programme (FTLRP) on 15th July 2000 (Utete, 2003), and the programme was also implemented in Mashonaland East Province. The programme was designed to be undertaken in an accelerated manner and with reliance on local resources with the following objectives as stated in policy documents:

[12] (http://upload.wikimedia.org/wikipedia/commons/6/6f/Mashonaland_East_districts.png)

- The immediate identification for compulsory acquisition of not less than 5 million hectares for Phase II of the Resettlement Programme, for the benefit of the landless peasant households
- The planning, demarcation and settler emplacement on all acquired farms
- Provision of limited basic infrastructure (such as boreholes, dip tanks and scheme roads) and farmer support services (such as tillage and crop packs) (Utete, 2003)

The FTLRP program comprises two models: [13]Model A1 intended to decongest communal areas and is targeted at land-constrained farmers in communal areas. This model was based on existing communal area organisation, whereby peasants produce mainly for subsistence. [14]Model A2, on the other hand, is a commercial settlement scheme comprising small-, medium-, and large-scale commercial settlements, intended to create a cadre of black commercial farmers. This model is, in principle, targeted at any Zimbabwean citizen who can prove farming experience and/or resource availability and is based on the concept of full cost recovery from the beneficiary (GoZ, 2000). The distribution of the irrigated area by category, pre- and after the FTLRP is as shown in Table 5.1 below. Such a distribution is crucial to the study as it determine the selection of the target population based on the category of the scheme.

[13] *Model A1 Model A1 was for the generality of landless people, with a villagised and self-contained variant.*

[14] *Model A2 on the other hand was a commercial settlement scheme comprising Small, Medium and Large-Scale Commercial settlement.*

Table 5.1: National distribution of the irrigated area (ha) pre and after FTLRP

Category	Size of irrigated area			
	Before FTLRP		After FTLRP	
	Area	% total area	Area	% total area
A1	-	-	7,620	6.3
A2	-	-	12,450	10.3
Communal & resettlement	10,000	6	11,860	9.8
Indigenous large scale commercial	-	-	9,250	7.7
Traditional large-scale commercial	139,500	73	8,140	6.8
ARDA	13,500	8	7,620	6.3
Settler	3,600	2	3600	-
Others	-	-	63,470	52.7
Informal	20,000	11	20,000	-
Total	186,600	100	120,410	100

Source[15]: Cited in Utete (2003)

The distribution in Table 5.1 above shows an increase in the number of A1, A2 and indigenous large scale farmers (ILSCF), new categories in the irrigation sector in Zimbabwe. The A2 and ILSCF categories are mostly made up of individual farmers. The statistics in Table 5.1 were broken down into provincial distribution and the statistics per province are as shown in Table 5.2 below.

[15] *IFAD (1997)*

Table 5.2: Provincial distribution of formal irrigated area (ha) after FTLRP

Province	A1	A2	C & R[16]	Indig LSCF	Trad LSCF	ARDA	Other	Total
Mashonaland East	650	1,790	1,000	590	500	580	10	5,120
Midlands	540	640	1,040	110	640	400	510	3,880
Manicaland	2,980	3,950	4,180	890	1,920	4,090	28,890[17]	43,900
Mashonaland Central	2,000	2,450	760	6,220	3,050	100	320	14,900
Matebeleland South	70	1,200	1,400	-	100	940	-	3,710
Matebeleland North	340	70	200	170	270	400	-	1,450
Mashonaland West	500	1,830	1,400	1,070	1,320	1,110	3,160	10,390
Masvingo	540	520	1,880	200	340	-	33,580	37,060
Total	**7,620**	**12,450**	**11,860**	**9,250**	**8,140**	**7,620[18]**	**63,470**	**120,410**
% irrigated area	***6.3***	***10.3***	***9.8***	***7.7***	***6.8***	***6.3***	***2.7***	***100***

Source: Cited in Utete (2003)

[16] Communal and resettled farmers

[17] The basis of the figure was not known

[18] The figure was said to be way below the most cited of 13,500ha

Table 5.2 shows that in Mashonaland East province, most of the irrigated land lied in the hands of the A2 and communal and resettled farmers, with a total irrigable area of 5,120ha. For purposes of this study, the thesis targeted mainly the A1s *(especially A1 group farmers in the province) and* communal and resettled farmers based on the communal or collective management of irrigation water resources. The A2s, indigenous and traditional large scale farmers, who mainly work as individuals were targeted as part of key informants.

5.3 Research methodology

5.3.1 Institutional effectiveness evaluation framework

In efforts to evaluate the effectiveness of irrigation water management institutions with respect to agricultural water management objectives, an evaluation framework for the research study has been designed and presented in Figure 5.3 below.

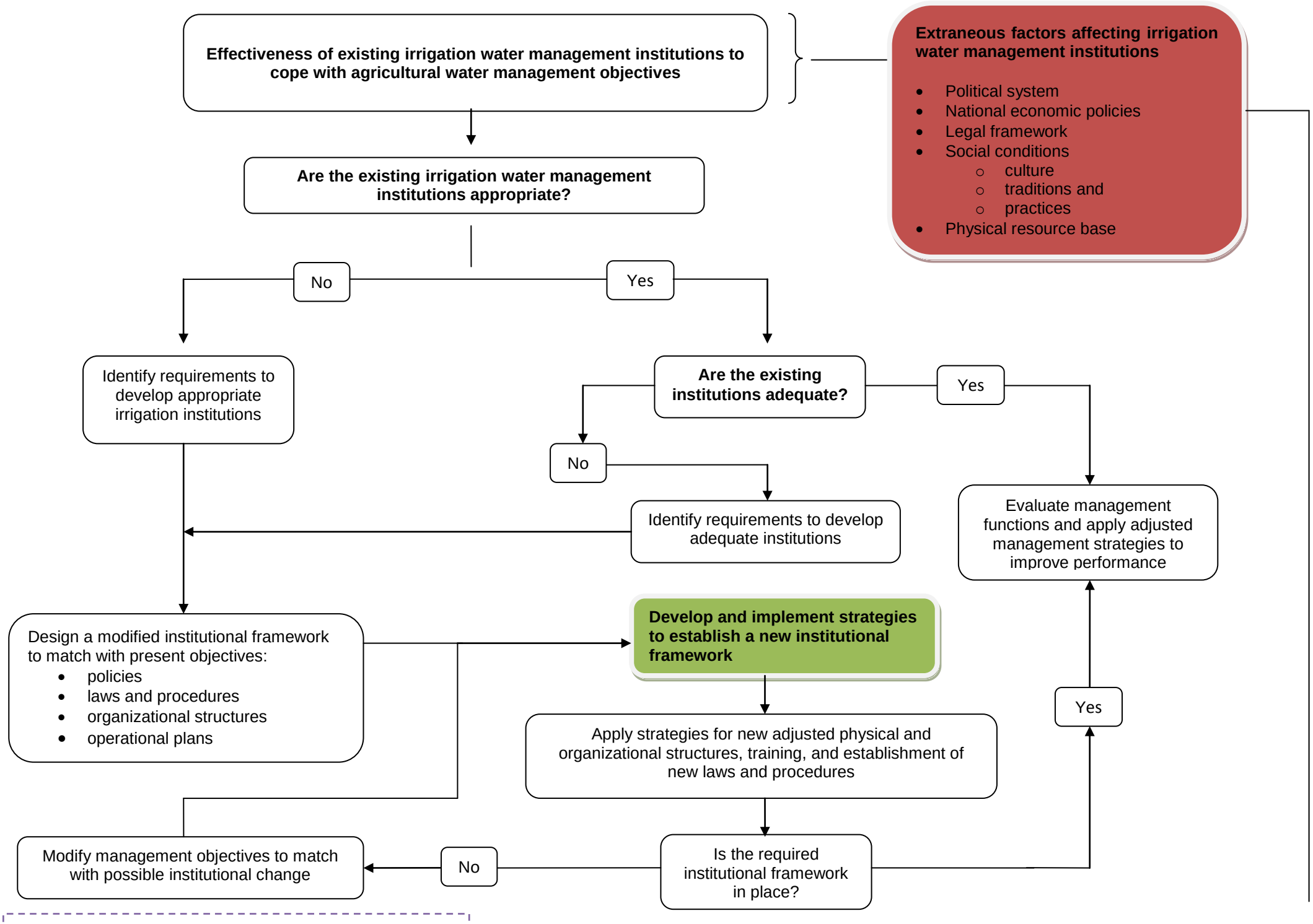


Figure 5.3: Institutional effectiveness evaluation

Figure 5.3 shows some of the main external factors which can be identified as either constraints or enabling situations that affect the irrigation water management institutions in the country. The overall political system, national economic policies, legal framework, socio-economic environment and the physical resource base are some of the external influences. For instance, the overall national policies play a significant role in fashioning the institutional framework for any given social context and in this case, irrigation water management.

In addition, the legal framework situation in a country, and in particular, the social conditions, can determine how the laws and rules are applied and adjudicated. Consequently, this has a significant effect on water management institutions. In some instances, the culture, traditions and practices inhibit the effective functioning of irrigation water management institutions, whereas, in some other instances, they tend to promote them. For example, this has been supported by Sokile & van Koppen (2004) who argued that in some cases, customary local practices and structures can also contain or help avoid conflicts.

Similarly, North (1993) notes that institutions are not necessarily or even usually created to be socially efficient, rather, they, or at least formal rules, are created to serve interests of those with bargaining power to create new rules. In this case, institutions can either promote management or inhibit if they tend to serve self-interests. In order to assess the actual impact of these external influences, it is useful to have an understanding about the social conditions, traditions and practices in the given context. It is thus expected that at

the end of the research, this thesis will highlight some of these conditions, applicable to the Zimbabwean context and thus will assist in the formulation of a sustainable and effective institutional framework for agricultural water management in Zimbabwe.

5.4 Evaluation methodology

The effectiveness framework outlined above provides a basis for developing a methodology for quantitative evaluation of both the institutional linkages as well as the institution performance linkages. The section below provides the definition of variables that were collected for data analysis.

5.4.1 Definition of variables

The definition of both the institutional and performance variables flows directly from the analytical decomposition of irrigation water institutions and irrigation water sector performance. To facilitate a better interpretation of these variables, their nature and format, including the range of values they can take has also been presented and described. The institutional and performance variables and the values they take are defined in Tables 5.3 – 5.6 below.

Table 5.3 Irrigation water law component and explanatory variable evaluation criteria

Dependent component	Explanatory Variable	Acronym	Data type	Variable evaluation criteria	Expected relationship
IRRIGATION WATER LAW (LOIWL)	Access to water rights	LAWR	Dummy	1 = yes; 0 = otherwise	+
	Format of water rights	LFWR	Dummy	0 = no rights; 1 = unclear/scattered rights 2 = common state property 3 = riparian system 4 = correlative (proportional) sharing 5 = licenses/permits	+
	Aware of the existence of irrigation water law	LEWL	Dummy	1 = yes; 0 = otherwise	+
	Provisions effective for conflict resolution[19] mechanisms	LCRM	Scale	Captured in terms of judgemental perception on a scale of 0 – 10	+
	Water law relevant for irrigation water users under current and future situation	LRCF	Scale	Captured in terms of judgemental perception on a scale of 0 - 10	+
	Relationship of water law with other laws to promote irrigation water management	LLOL	Scale	Captured in terms of judgemental perception on a scale of 0 - 10	+
	Water law provisions to promote private sector participation	LPPS	Scale	Captured in terms of judgemental perception on a scale of 0 – 10	+

[19] The conflict resolution mechanisms considered for evaluation include bureaucratic systems, tribunals, judicial/legislative mechanisms, WUAs, etc

Table 5.4: Irrigation water policy component and variable evaluation criteria

Dependent Component	Explanatory variable	Acronym	Data type	Variable evaluation criteria	Expected relationship
IRRIGATION WATER POLICY (POIWP)	Irrigation project selection criterion is economic-oriented	PPSC	Dummy	1 = yes 0 = otherwise	+
	Pay for use of irrigation water	PUIW	Dummy	1 = yes 0 = otherwise	+
	Form in which irrigation water if paid for	PFIP	Dummy	0 = full subsidy (no payment) 1 = partial recovery 2 = full-cost recovery	+
	Impact of the policy for promoting private sector participation	PGPP	Scale	Captured in terms of judgemental perception on a scale of 0 – 10	+
	Extensiveness of private sector participation in irrigation water management	PEPP	Scale	Captured in terms of judgemental perception on a scale of 0 – 10	+
	Organised into Water Users Associations (WUAs)	PWUA	Dummy	1 = yes 0 = otherwise	+
	Extensiveness of WUAs' participation in irrigation water management	PEWA	Scale	Captured in terms of judgemental perception on a scale of 0 – 10	+
	Impact of the policy for promoting users' participation	PIUP	Scale	Captured in terms of judgemental perception on a scale of 0 – 10	+
	Extent of influence of other policies[20] on irrigation water policy	PEOP	Scale	Captured in terms of judgemental perception on a scale of 0 - 10	+
	Extent of linkages between irrigation water law and irrigation water policy	PWPL	Scale	Captured in terms of judgemental perception on a scale of 0 - 10	+

[20] Some of these policies to be considered include: fiscal policies, economic policies, investment policies, etc

Table 5.5: Irrigation water administration component and variable evaluation criteria

Dependent Component	Explanatory variable	Acronym	Data type	Variable evaluation criteria	Expected relationship
IRRIGATION WATER ADMINISTRATION (AOIWA)	Capacity of the administration of irrigation water at scheme level	ACIW	Scale	Captured in terms of judgemental perception on a scale of 0 – 10	+
	Effectiveness of user groups or WUAs in administration of irrigation water	AEWA	Scale	Captured in terms of judgemental perception on a scale of 0 – 10	+
	Private sector participation reduces burden on irrigation water administration and management	APPA	Scale	Captured in terms of judgemental perception on a scale of 0 – 10	+
	Mechanisms of collecting updates and do maintenance of irrigation water at scheme level	AMUM	Dummy	1 = yes 0 = otherwise	+
	Adequacy, relevant and reliability of water data in irrigation water management at scheme level	AARR	Scale	Captured in terms of judgemental perception on a scale of 0 – 10	+
	Capacity to effectively administer irrigation water through use of the irrigation water law and policy	ACLP	Scale	Captured in terms of judgemental perception on a scale of 0 – 10	+

Table 5.6: Informal irrigation water management component and variable evaluation criteria

Dependent Component	Explanatory variable	Acronym	Data type	Variable evaluation criteria	Expected relationship
INFORMAL WATER MANAGEMENT INSTITUTION (INFWI)	Clearly defined boundaries to withdraw irrigation water CPRs	ICPR	Dummy	1 = existing; 0 = otherwise	+
	Existing appropriation rules[21] related to the local conditions	IARL	Dummy	1 = existing; 0 = otherwise	+
	Mechanisms, e.g. constitutions to assist in irrigation water management	IMSL	Dummy	1 = existing; 0 = otherwise	+
	Effectiveness of management mechanisms in water management	IEMM	Scale	Captured in terms of judgemental perception on a scale of 0 – 10	+
	Effectiveness of monitoring, conditions and the behaviour of appropriators	IEMA	Scale	Captured in terms of judgemental perception on a scale of 0 – 10	+
	Existence of regulation sanctions for users who fail to act accordingly	IERS	Dummy	1 = existing; 0 = otherwise	+
	Existence of rapid access to conflict solving in the low-cost, local setting	IECS	Dummy	1 = existing; 0 = otherwise	+
	Users challenging rights of appropriators to create own local-based institutions	ICRA	Dummy	Captured in terms of judgemental perception on a scale of 0 – 10	+
	Extent of challenge of the rights of appropriators to create own institutions	IECA	Scale	Captured in terms of judgemental perception on a scale of 0 – 10	+
	Effectiveness of informal institutions to influence law, policy and administration	IOEI	Scale	Captured in terms of judgemental perception on a scale of 0 – 10	+

[21] Evaluated in terms of their restriction to the time, technology, place or quantity of resource units based on the local aspects.

The variables defined in the Tables 5.3 – 5.6 above are self-explanatory and present general characteristics. Both the institutional and performance variables are grouped into two broad categories; the factual and perceptional variables. Factual variable are observable while perceptional variables involve judgemental considerations and cannot be observed.

The variables have also been categorised into three categories;

- Dummy variables where 1 indicates the existence or otherwise of a given institutional aspect.
- Categorical variable attempts to place a given institutional aspect into a fixed number of feasible categories. The numerical value for each category is assigned consciously to obtain an ascending order in terms of their values. The bounded nature of the scale variables within 0-10 range has important implications; zero meaning the worst situation and 10 meaning an ideal situation.
- The intermediate values taken by the scale variables can be interpreted as the extent the actual situation deviates from either the worst or the ideal situation.

5.4.2 Model specification

Given the set of institutional and performance variables, it is therefore important to characterise the institution-performance interaction within the water sector. The following set of equations describes the functional relationships of the evaluation of both irrigation

water institution and irrigation water sector performance. The dependents variables (effectiveness of institutions) will be assessed based on their presence (effectiveness) or otherwise. This therefore leads to formulation of the following working requations:

$LOIWL = f_1(LAWR;LFWR;LEWL,LCRM;LRCF;LLOL;LPPS)$.....equation 1

$POIWP = f_2(PPSC;PUIW;PFIP;PGPP;PEPP;PWUA;PEWA;PIUP;PEOP;PWLP)$.....equation 2

$AOIWA = f_3(ACIW;AEWA;APPA;AMUM;AARR;ACLP)$…….…….....equation 3

$INFWI = f_4(ICPR;IARL;IMSL;IEMM;IEMA;IERS;IECS;ICRA;IECA;IOEI)$.....equation 4

$INFWI = f_5(LOIWL, POIWP, AOIWA)$.....equation 5

$INFWI=f_6(LAWR;LFWR;LEWL,LCRM;LRCF;LLOL;LPPS;PPSC;PUIW;PFIP;PGPP;PEPP;PWUA;PEWA;PIUP;PEOP;PWLP; ACIW;AEWA;APPA;AMUM;AARR;ACLP)$……equation 6

Equation 1, 2, 3 and 4 are central and crucial as they depict structural linkages between the water institutions and their constituents. Equation 1 shows that the overall performance of their irrigation water law is a function of 7 irrigation water law constituents. These legal constituents are shown in Table 5.3 above. Similarly, equation 2 and equation 3 presents the overall performance of the irrigation water policy as a function of 10 irrigation water policy constituents and the overall performance of irrigation water administration as a function of 6 aspects respectively as also depicted in Table 5.4 and Table 5.5 above. Equation 4 shows the overall performance of the informal institution component and is a function of 10 constituents. The constituent variables are also shown in Table 5.6 above.

While the first four equations are designed to capture the functional linkages within each of the four irrigation water institution components, equations 5 and 6 show performance of informal water institution and formal water institutions.

Thus, when these equations are estimated within an appropriate empirical context, the Ordinary Least Squares (OLS), the sign and size of their coefficients could provide valuable insights into the relative role that various institutional aspects play in influencing the performance of both formal and informal irrigation water institutions. It is the first time that the above analytical approach has been formulated to enable the study of the effectiveness of irrigation water institutions in water resources management.

5.5 Data Collection

5.5.1 Analysis approach

Institutional analysis of irrigation systems is very complex. Usually, some of these resources are characterised by multiple users. In addition, there is need for arrangement for negotiation and mechanisms for conflict resolution among different stakeholders. Rules for sharing the resources comprise property rights, which are useful in resolving conflicts and creating incentives for investment for the development of the resource. At the same time, there is need to have institutions for collective action, either in the form of formal organisations or informal forms of cooperation, to abide by the property rights as well as act collectively for betterment of the community.

However, Bamberger (2000) argues that qualitative approaches are increasingly used in conjunction with quantitative approaches and such combinations can enhance validity and reliability of analysis and evaluation. Given the nature of this study, this thesis used both qualitative and quantitative approaches to ensure reliability and validity of data collected.

5.5.2 Sampling and questionnaire administration

According to Bless & Smith (2000), there are advantages associated with interviewing the whole population. Data obtained from the whole population is more reliable, when compared to sample data. However, in this research study, a sample is going to be used because of the limiting time and financial resources.

Generally, irrigation schemes display a heterogeneity nature with regards to composition, type, and their operation and maintenance, and above all, irrigation water resources management. As such, the target sample population for the study is depicted in Table 5.7 below.

Table 5.7: Stratification of the study population

Type of ownership	Number of schemes targeted
A1[22] irrigation schemes	36
A2 irrigation schemes	43
Communal & resettled irrigation schemes	41
Total questionnaires	**120**

Stratified sampling was done to categorise irrigation schemes into the three strata; A1s, A2s and communal/resettled farmers. From each stratum, simple random sampling was done to select the target irrigation schemes[23] in the province. A total of 120 questionnaires were administered for the research study. From both the A1 and communal/resettled irrigation schemes, the researcher targeted the working committee of the group for key respondent interviews while for A2 farmers, the person in charge of the farm was targeted for interviews.

The key instrument for data collection was a structured questionnaire. The questionnaire was designed in such a way that it solicited both qualitative and quantitative data. The questionnaire captured variables on formal irrigation institutions defined by *irrigation water law, policy, administration* and variables on the informal institutions, and their respective aspects and overall performance of the water sector and its subsequent constituents as outlined in Figure 4.2 and Tables 5.3 to 5.6.

[22] Schemes under A1 category and collectively operated

[23] For a scheme to be selected for the study, it should have been functional for at least the past 5 years and at the time of the interview.

Enumerators were recruited for the questionnaire administration process. The enumerators were selected from the province for two major reasons; their ability to speak in vernacular language and secondly, to cut on the research costs. These enumerators were trained on the whole process of questionnaire administration (introductions until the interview is completed) to acquainted themselves with the requirements of the questionnaire before getting into the field. Pre-testing of the study questionnaire was also done to ensure that unnecessary questions were removed from the questionnaire, in case of repetitions and to ensure that unforeseen problems were detected early.

5.5.3 Data analysis

Data collected were coded and entered and ran in the Statistical Package for Social Scientists (SPSS Version 20) software and Microsoft Excel program for analyses. Descriptive statistics (mean and standard deviations), institutional decomposition analysis (IDA) approach and a OLS regression model were used as the main analytical tools. The main descriptive indicators that were employed are mean values for all the variables. These are useful in analysing the relationship between dependent variables (overall irrigation water institutions) and explanatory variables (irrigation water institution aspects as outlined above in this chapter).

5.6 Limitations of the study

- The budgetary constraints restricted the research to only one province of Zimbabwe.
- The information could have errors that resulted from respondent bias. Potential prejudices of the data could include those of recall of data.
- Respondents' willingness to report information as accurately as possible could have biased data due to difficulties in recalling information

However, greatest precaution was taken to ensure that the study obtained reasonable and more accurate data, e.g. probing further in cases where a respondent could have given conflicting responses.

5.7 Conclusion

Zimbabwe is a landlocked country divided into ten administrative provinces and five broad Natural Regions based on rainfall distribution and soil types. Rainfall patterns and crop production deteriorate from NR 1 to NR 5. Zimbabwe's climate is more on the temperate side due to the high altitude of the central plateau.

The country has seven major rivers that flow into seven river catchments and reservoirs are being developed to better exploit the country's water resources. The irrigation potential of the country draws primarily from the surface water resources. On this note, it is

important to acknowledge that only 37% of the country can sustain rain-fed agriculture, while the remainder depends on supplemental or full-time irrigation. The irrigation potential of the country stands at 500,000ha, while the developed irrigation area 200,000ha. However, many systems have deteriorated or dilapidated during the land reform programmes.

Under the formal law, the state owns all the surface and ground water resources and all the citizens have the rights to water for primary uses, while secondary uses need state approval.

Mashonaland East province overlaps into NR IIa, IIb, III and IV and is suitable for intensive crop farming, dairy, horticulture and production of small grains. The province also had irrigated farms targeted redistribution under the land reform programme where new farmers were introduced into the irrigation sector, with most of the land given to A2 farmers. The other categories that benefited during the land reform programme included A1s, communal and resettled farmers, indigenous large-scale commercial farmers (LSCF), traditional LSCF, ARDA and others. The next chapter outlines the methodology used to collect data on a number of formal and informal institutional variables and the methods of analysis.

In light of this, the study therefore attempted to employ a methodology that evaluates the effectiveness of institutions from this angle to formulate an effective irrigation water management framework in Zimbabwe. Therefore, data was collected from the study

population based on the formal and informal institutions used in the management of irrigation water resources. The following chapter discusses the descriptive results of the study based on the methodology used to solicit data.

CHAPTER 6 – DESCRIPTIVE STUDY FINDINGS

6.0 Introduction

This chapter presents the descriptive statistics for the study. Mainly, it employs the mean and standard deviation values on the main variables that have been studied in this research. The main objective of this chapter is to provide a preliminary background on the effectiveness and nature of water management institutions (formal and informal) in the management of irrigation water resources.

It is important to understand the need to evaluate the formal and informal irrigation water institutions that are used to manage irrigation water, and the nature of relationship existing between an institution and its facets. This is based on the fact that water management does not only depend on appropriate technologies and efficient market prices (Gebremedhin *et al.* 2002), but also on local level institutions and organisations that enforce them. The sections below describe the nature and effectiveness of the formal and informal institutions on irrigation water management.

6.1 Legal variables

The IFAD report (1997) states that productive water use by smallholder farmers cannot be achieved by merely changing water legislation. This has been evidenced by the fact that changes in the water legislation in the post-colonial era failed to bring about the much-

needed increase in productive water use. In light of this, Manzungu & Machiridza (2005) state that water laws are likely to succeed if underpinned by a sound economic ideology. As such, the study evaluated the effectiveness of the irrigation water law in managing water resources and how it can work in harmony with other institutions to manage irrigation water resources. Table 6.1 presents the analysed descriptive statistics for the legal institutional variables under study.

Table 6.1: Descriptive statistics: perceptional-based legal institutional and performance variables

Irrigation water law variables	Acronyms	Type of data	Mean values	Standard Deviation	Range	
					Min	Max
Access to water rights	LAWR	Dummy	*0.371*	*0.236*	0	1
Format of water rights	LFWR	Dummy	*1.340*	*0.117*	0	5
Existence of irrigation water law	LEWL	Dummy	*0.313*	*0.461*	0	1
Provisions effective for solving conflicts among irrigation water users	LCRM	Scale	*3.641*	*3.314*	0	10
Water law relevant for irrigation water users under current and future situation	LRCF	Scale	*2.414*	*1.423*	0	10
Irrigation water law relationship with other laws to promote water management	LLOL	Scale	*4.341*	*2.532*	0	10
Water law provisions to promote private sector participation	LSPS	Scale	*5.266*	*2.160*	0	10

Source: survey data (2012)

Water rights are mechanisms through which a user can access water for a particular use without jeopardising another user's right (Sokile & van Koppen, 2004). Water rights can be local or customary, i.e., means by which users may access water and establish allocation mechanisms among themselves without necessarily having a written document to define volumes and times for abstraction. Water rights are, however, mostly thought to be statutory, i.e., a blueprint document issued by the government, defining volumetric allocation of water and, sometimes, period for that particular allocation, and to whom it is provided for (Sokile & van Koppen, 2004).

Property rights for water users entail right to access a certain amount and quality of water, collective protection against conversion of irrigated lands, use of irrigation infrastructure, irrigation services, etc. (North & Thomas, 1977). An analysis on whether the users had access to water rights was done. The variable on access to irrigation water rights was treated as a dummy variable, where 1 = access to water rights and 0 = otherwise.

The mean value for the variable was 0.371. Such a distribution is oriented towards 0, implying that most users have indicated they did not have or had little access to water rights. The results could be explained by the colonial history of Zimbabwe, where the black indigenous farmers were disadvantaged because they had not applied for water rights (Manzungu, 2001) and when they wanted to apply for water rights, most of the water was committed to water rights held by white farmers, which were issued in perpetuity and could not be revoked.

Furthermore, this could be explained by the neglect of indigenous water and irrigation management, where state intervention tended to disenfranchise smallholder farmers because of introduced legal systems (Rukuni, 1993). For example, smallholder irrigators lost their rights over land, water and other resources. Rukuni (1993) further notes that failure by the colonial and post-colonial states to acknowledge traditional water management practices, despite contributing to rural food security, failed to offer a platform where smallholder farmers will be presented with water rights. In addition, Manzungu & Senzanje (1996) also report that the water rights of the indigenous population which predated the settler claims were disregarded, thus leaving most farmers without water rights.

Such a trend suggests that farmers will not have any meaningful development and management of water resources at their schemes. This could also result in mismanagement of irrigation water resources as the farmers will not have a sense of ownership to the water resources. According to Demsetz (1967) and Coase (1960), well established private property rights represent the most efficient system of land use. Using the same argument, water rights also represent the most efficient and effective system of water use and management.

While users may have access to water rights, what counts also is the nature of these property rights. Absence of clearly defined and well-enforced property rights significantly increase risks (Coase, 1960). The same argument can be followed with regards to

irrigation water management, where unclear/scattered water rights increase the risks of mismanagement of water resources.

The analysis for format of water rights was treated as a dummy type of data, with 0 = no water rights; and 1 – 5 represented formats of water rights. The mean value of 1.340 is skewed towards a situation where most farmers had no water rights or had unclear/scattered rights. The results concur to a study by Zaleke (2006) in Ethiopia, which found out that farmers had multiple water rights emanating from both the customary and formal water acts and have co-existed to direct the actions of users. Such a trend, where users either do not have rights or have unclear rights can increase risks of farmers mismanaging water resources as they would not any sense of ownership.

Being aware of the existence of the irrigation water law can be an effective tool for promoting the efficient management of water resources. This is because users will have more information available to them within the water law, and also how they are expected to treat irrigation water resources with regard to mainly development and management. As such, users were asked if they were aware of the existence of the water law, in which case the variable was treated as a dummy variable, 1 = aware of the existence of the water law, while 0 = otherwise.

The mean value of 0.313 is again inclined towards 0, the worst situation, suggesting that most users were either not aware or were not fully aware of the existence of the water law to regulate and govern how they should use water resources. Such a pattern suggests the

users may not be acquainted with the laws and principles of how water resources development and management should be focussed. This could also be explained by the fact that the “Fast-Track Land Reform Programme” (FTLRP) of 2000 in Zimbabwe brought in new cadres in the irrigation water sector, who may not have been aware of the existence of the water law. This negatively jeopardises the principles of irrigation water resources development and management as may be stated within the irrigation water law.

Lack of knowledge on the existence of the irrigation law could be explained by the behavioural assumptions and human actors’ theories discussed in Section 3.8, where human actors have bounded rationality (Simon, 1957) rather than perfect knowledge. Human actors lack complete knowledge to assess their decision alternatives due to their cognitive limitations, time and information constraints (Williamson, 2000; Brousseau & Glachant, 2002). As such, they lack that mentality to make informed decisions on how water use should be directed. This leads to poor management of water resources.

The respondents who, however, acknowledged the existence of the water law were probed on whether the water law had provisions to solve conflicts at scheme level. Their responses were based on perceptional judgement, on a scale of 0 – 10. Their responses yielded a mean value of 3.641, a figure more skewed towards the worst situation suggesting that users indicated that there are either no provisions or little provisions for conflict-solving within the water law. In a case where conflict-solving provisions lack, it may mean users end up seeking arbitration from the legal courts.

However, the challenge facing informal conflict mediation arrangements is that the formal courts of law tend to nullify the rulings of the former (Sokile & van Koppen, 2004). This encourages those who are somewhat knowledgeable to run to the courts of law, although the formal 'winner-takes-all' ruling reached is likely to propel the issue toward new dimensions of conflict. This may mean perpetuation of the conflict, eventually leading to poor irrigation water management.

The users who acknowledge the existence of the water law were also asked whether the water law was relevant for the users under the current and future situation, based on a perceptional judgment on a scale of 0 – 10.

The results of such an analysis depicted a mean value of 2.414, which suggests that most users who responded moistly indicated a lower score, skewed towards the worst situation of 0. Irrelevancy of the irrigation water law for current and future users could be based on the lack of enforcement of the 1998 Water Act, despite it being regarded as technically sound, with a solid base for sustainable and efficient utilisation of water resources (Section 2.2.7.7). This is because vital sections of the act have not been fully enforced; hence, its founding principles could not be supported. For example, the Water Fund has collected insufficient revenue adequately to support statutory functions.

As such, mechanisms should be put in place to allow for the water law provisions to be enforced so that its objectives of effectively managing irrigation water resources are achieved. In the theory of economics of institutions and economic growth, Matthews

(1986) argued that institutions need continual adaptation in the face of changing environment of technology and taste to promote economic growth. In light of this, the irrigation water law should thus consider the radical changes in the water sector, particularly the emergence of new irrigation farmers of the land reform programmes and thus align it to the needs and conditions of these new farmers.

For the water law to be an effective irrigation water management institution, its relationship with other economic laws is crucial. Farmers were asked, on a scale of 0 – 10, their perceptional judgment on the nature of relationship between the irrigation water law and other laws they know.

The results depict a mean value of 4.341. The mean value is below the average ideal situation and inclined towards the worst situation, suggesting a situation where farmers are of the opinion that the irrigation water law does not have a favourable relationship with other economic laws. Lack of a workable relationship between the water law and other laws, e.g. environmental law, energy laws implies poor coordination, hence, can lead to poor irrigation water development and management.

Water law provisions that will promote private sector participation in irrigation water resources development and management, by default, will promote efficient irrigation water management. The advantage of participation by the private sector would be the facility in identifying appropriate institutional measures for effectively attending to a number of resource management needs: arresting free-rider behaviour among the members, mobilising the needed financial and labour resources, imposing sanctions on individual

members for resource degradation, providing incentives for resource saving, interacting with the government and other individuals and organizations such as suppliers, contractors and purchasers of produce, and developing and implementing group decisions for equitable resource distribution and environmental protection. Farmers were asked on whether the irrigation water law had some provisions of promoting private sector participation, based on a scale of 0 – 10.

The mean value of 5.266 inclined towards the ideal situation, implying farmers have indicated a fair existence of water law provisions that cater for private sector participation. This could be explained by the fact that water reforms (Section 2.2.7) introduced radical changes regarding the participation and representation of water users in the management of and decision making on water. The 1998 Water Act provided a legal basis for the representation and participation of previously excluded water users, namely communal, resettlement and small-scale commercial farmers. This inclusiveness and participation has encouraged local level participation in water management at sub-catchment council levels. This creates a conducive environment where private sector participation would result in sustainable irrigation water development and management activities.

6.2 Policy variables

Effective management of agricultural water requires continuous back-up policies and institutional frameworks (FAO, 2008). As such, farmers were asked their perceptional judgements on policy variables to evaluate irrigation water policy as an institution of

managing irrigation water resources. The descriptive results of policy variables are shown in Table 6.2 below.

Table 6.2: Descriptive statistics: perceptional-based policy institutional and performance variables

Irrigation water policy variables	Acronyms	Type of data	Mean values	Standard Deviation	Range	
					Min	Max
Project selection criterion is economic-orientated	PPSC	Dummy	*0.214*	*0.428*	0	1
Pay for use of irrigation water	PUIW	Dummy	*0.384*	*0.413*	0	1
Form in which irrigation water is paid for	PFIP	Dummy	*1.361*	*0.381*	0	2
Policies favourable for promoting private sector participation	PGPP	Scale	*3.148*	*3.861*	0	10
Extensiveness of private sector participation in irrigation water management	PEPP	Scale	*3.266*	*2.184*	0	10
Organised into Water Users' Associations (WUAs)	PWUA	Dummy	*0.318*	*0.426*	0	1
Extensiveness of Water Users Association 'participation in irrigation water management	PEWA	Scale	*2.048*	*0.176*	0	10
Policies favourable for users' participation in irrigation water management	PGUP	Scale	*3.648*	*2.481*	0	10
Effect of other policies like fiscal, economic policies in irrigation water management	PEOP	Scale	*6.516*	*2.662*	0	10
Water policy links well with water law	PWPL	Scale	*2.018*	*0.748*	0	10

Source: survey data (October, 2012)

The results in Table 6.2 depict the perceptional-based policy variables descriptive statistics. A water policy that clearly defines project selection criteria can promote efficient irrigation management, especially if the objectives of the irrigation are clear. In a case where project selection is economic-oriented, then it is most likely that it encourages efficient irrigation water management. Economic-oriented projects seek to meet economic growth and development objectives, and usually are monitored and implemented under supervision. Such a scenario presents a case where irrigation water management is promoted. Farmers were probed their opinion on whether project selection was economic-oriented, and the variable was treated as a dummy, where 1 = yes and 0 = otherwise.

A mean value of 0.214 is inclined towards the worst situation, implying that farmers were mostly of the opinion that project selection was not or was less economic-orientated. This was also noted by Utete (2003), where challenges existed in prioritisation of the development of water/irrigation projects according to well defined criteria. Utete (2003) further notes the challenges in carrying-out proper assessments of irrigation investments and projects, including their financial feasibility, without ignoring social and political objectives.

On the other hand, inappropriate conventional budgeting technique, which has ignored the smallholder irrigation sector's unique history (Rukuni, 1993), could also explain why irrigation project selection is not economic-oriented. A situation of this nature negatively affects irrigation water management as irrigation schemes that are implemented without

expected objectives may lack supervision and effective monitoring mechanisms, hence, poor irrigation water management.

An irrigation water policy that clearly defines how and why users should pay for irrigation water will promote and encourage sustainable irrigation water management. On one hand, if irrigation water users are aware that they are supposed to pay for use of irrigation water, they will ensure they use irrigation water in an efficient way. On the other hand, the money that is paid by the water users will ensure that repairs, operation and maintenance of dilapidated irrigation water equipment are carried-out. Generally, there is a belief that the purpose of paying for water use is to ensure sustainability of services, water conservation and mitigation of damages (Gorriz *et al.,* 1995). Whether farmers pay for irrigation water or otherwise was treated as a dummy variable, where 1 = yes and 0 = otherwise.

The results analysed show a mean value of 0.384, which is skewed towards the worst situation representing less commitment or non-payment of user fees for irrigation water. Even the creation of the Water Fund (Section 2.2.7.3) embedded in the 1998 Water Act with the objectives of collecting levies, fees, government contributions and any other support towards water service provision did not help as inflows have been minimal. Unease ensured, which resulted in many farmers not paying for their permits as they were uncertain as to their continuing occupancy on their land with respect to the new land reforms. Similarly, new users were reluctant to pay for water use as water rights had not been paid for previously. This has left little money to support water service provision and such contributes to poor irrigation water management as repairs and maintenance activities are not attended to.

These results could also be explained by the challenges that Utete (2003) noted, after the FTLRP of inculcating a culture of paying for commercial use of water by water users. Moreover, most farmers also stopped paying for irrigation water after their farms were invaded during the FTLRP (Kujinga, 2002). In addition, most farmers in Zimbabwe have refused to pay for water use, arguing that water is a natural resource that comes from "God", and even if they pay, the revenue is not re-invested back into their schemes. Machingambi & Manzungu (2002), in their study, state that most farmers have considered water as a free good; hence, they do not pay for it.

Similarly, Samad (2005) also reports that many governments have moved away from imposing the full costs upon water users of irrigation for political reasons because farmers resist charges. In support of the political role in water payments, Abu-Zeid (2001) highlighted that in many parts of the world, charging users for irrigation water services is a sensitive issue and water beneficiaries believe that low or zero charges are justified and this belief is usually justified in their political system. Such could also be the situation from the Zimbabwean point of view. This suggests that efficient water irrigation management objectives could be jeopardised. As such, the irrigation water policy could be an effective tool of managing water resources if it clearly specifies and promotes user-pay principles.

However, it is also important to note that even though farmers pay for use of irrigation water, the form in which they pay for water use is also crucial. Farmers who indicated they pay for irrigation water were probed on the format in which they pay, based on the following dummies; 0 = fully subsidy payment; 1 = partial recovery or 2 = full-cost

recovery. The base, 0 was taken to represent a situation where farmers do not pay any fees, while 1 and 2 represent a situation where farmers pay for water use at different scales (partial or full cost recovery)

A mean value of 1.361 was depicted, which is inclined towards payment based on partial recovery. The results could be emanating from marked political interference in pricing of water (Section 2.2.7.9), where politicians, in a bid to retain popularity, aimed to keep the price of water as low as possible. Politicians frustrated the implementation of the pricing policy, which cannot afford to subsidise water service provision to maintain standards in good water service. However, while this could be the case, the most important fact is that farmers have to pay for use of irrigation water based on that water is treated as an economic good, as such, it has to have a price attached to it irrespective of the format in which farmers pay for irrigation water. Even if the users pay for irrigation water, the challenge, as Utete (2003) notes, also lie on ensuring that (part of) the water revenue is invested in water development and management so as to improve and make the irrigation water policy an effective tool in irrigation water management.

Private participation in irrigation water resources development and management can contribute to effective and efficient water management. However, this is highly achieved if the environment and conditions are favourable for private sector participation. In this light, a policy that clearly defines conditions that promote private sector irrigation water development and management is almost bound to be an effective institution in managing

water resources. Farmers were asked based on their perceptional judgement (on a scale of 0 – 10), whether the policy promotes private sector participation.

The analysed results depicted a mean value of 3.148, inclined towards the worst situation, suggesting that farmers feel the water policy does not fully provide for private sector participation. As noted by the Utete (2003), after the FTLRP, challenges prevailed in determining respective roles of private and public sector in irrigation. The existing gap in various roles played by the private and public sector negatively affects irrigation water management objectives. As such, the policy should have policies oriented towards private sector participation and also delineate the roles played by the private and public sectors in irrigation water management.

In addition to the above, even if the water policy conditions allow for private sector participation, the extent to which the policy allows private sector participation is crucial. Based on a scale of 0 – 10, farmers were asked the extent to which private sector participates in activities related to irrigation water management. The results yielded a mean value of 3.266. Such a distribution suggests that farmers are of the opinion that although private sector participates in irrigation water management, the extent of participation is low. As such, the irrigation water policy should ensure that it also provide clauses on how they make private sector visible in irrigation water management related issue thus making it an effective tool in managing water resources.

User groups, for example, Water Users Associations (WUAs) can play a crucial role in the management of irrigation water resources. This is based on the fact that these user groups

can act and implement activities on behalf of the formal rules and the informal rules at grass roots levels. In addition, manageable user groups within the irrigation communities helps not only in bringing about capacity building measures, but also in developing capability for collective action through effective participation.

Local informal groups are often amorphous, temporary, and difficult to appreciate by outsiders and they do not have written constitutions, registration numbers and vocal committees (Sokile & van Koppen, 2004). However, daily resource use interactions are widely determined by these relations. On the other hand, formal associations are often rigid, isolated, and difficult to enter into or, once in, to withdraw from. As a result, many water users choose the informal routes to address their resource use challenges. Local informal associations are influential, powerful and attractive to the local communities (Sokile & van Koppen, 2004). Moreover, most people feel stronger senses of identity and belongingness than in the formal WUAs. Hence, a policy that clearly supports and encourages organisation of users into local groups/associations can become an efficient and effective tool in water management related issues. The variable on whether farmers were organised into user groups was treated as dummy variable, 1 = yes and 0 = otherwise.

The results yielded a mean value of 0.318. Such a pattern suggests that fewer farmers were organised into user groups since the mean value is inclined towards 0, which represents non-organisation into user groups. The results could be based on lack of knowledge on water reforms (Section 2.2.7), especially for new users who may not know

the parameters within which they should participate and as such, fail to make informed decisions on water management processes. In addition, as explained in the earlier discussion in Section 2.2.7, identification and classification of water user groups from which representatives are elected to the sub-catchment council was a problem, in spite of what the 1998 Water Act provided for. A good example is where the act provided for inclusion of 'communal farmers' as a disparate group of water users, yet, even the local level water committees barely function and most are formed around ground water resources that barely get recognition at catchment council meetings.

Further to the above, in cases where communal areas have irrigation schemes, Irrigation Management Committees (IMCs) represent them at catchment level. However, these do not extend beyond the irrigation schemes which they are established for, rather, they seem to represent the interests and concerns of a particular irrigation scheme to which they belong.

In light of this, it is important that an irrigation water policy should clearly state the conditions that encourage and promote organisation of farmers into effective and recognised user groups. In addition, genuine participation in water management also occurs when water users and their representatives are informed and knowledgeable about the water reforms, especially with new water users who have little knowledge about the water reforms and policies that set the parameters for their participation.

However, a good example where farmers have organised themselves, as has been discussed in Section 2.2.6, is where A2 irrigation farmers in the Middle Sabi formed the Middle Save Farmers' Syndicate to represent their broad political, land and water interests. In this syndicate, political links and water issues were channelled through local structures until their grievances reached the Minister of Water. If users can follow such an example, where they would air their grievances through an official and local user group, issues that have to do with irrigation water would be of much help, hence, can lead to sustainable irrigation water management.

In a situation where farmers have organised themselves into user groups, the extent to which they participate and administer irrigation water management becomes crucial. Hence, a water policy that ensures extensive participation of WUAs can become an effective tool that can efficiently and effectively manage irrigation water resources. Farmers were asked the extent of WUAs participation in irrigation development based on perceptional judgment on a scale of 0 – 10.

An analysis on the extent to which the WUAs participate in irrigation water management revealed a mean value of 2.048. The trend suggests farmers are of the opinion that WUAs are not extensively participating in irrigation water management issues. This could be based on the fact that some of the farmers are new to the irrigation sector because of the FTLRP of 2000, which ushered in new cadres in the irrigation sector, who were more interested in consolidating their claim to the new properties than in attending water management meetings (Section 2.2.7.2). Poor WUAs participation in irrigation water

management leads to, for example, poor administration at scheme level, thus jeopardising irrigation water management objectives.

However, it is important to note that even if farmers organise themselves into WUAs, they can only be effective and extensive if policies are favourable for users' participation in irrigation water management. Effective user participation leads to an adjustment in the existing power relationships both within and outside the community. Participation brings about empowerment of the users, enabling them to take their own decisions in an agreed framework of rules. A policy that addresses user participation increases its capacity to manage irrigation water management. As such, farmers were asked, based on a scale of 0 – 10, their judgmental perception on the provisions of government policies in the policy that are favourable for users' participation.

The results depict an average of 3.648, suggesting that farmers are of the opinion that the water policy does not clearly provide for users' participation in irrigation water management, thus compromising irrigation water management objectives. The results concur to Tafesse (2003) who argues that government policies on, for example, land tenure and water allocation do not create conducive environment for successful operation of irrigation schemes by farmers. Furthermore, as discussed in Section 2.2.7, the 1998 Water Act provided for participation and representation of water users. However, this has been fraught with problems. For example, participation at sub-catchment level has often been stacked against new water users who lack financial resources to travel and attend sub-catchment council meetings. In addition,

There are other policies that complement the irrigation water policy in the management of irrigation water resources development and management, for example, fiscal and other economic policies. In light of this, the farmers were asked whether the other policies have an effect on the way irrigation water resources are managed. The probe was based on a judgemental perception, on a scale of 0 – 10 and the results yielded a mean value of 6.516. Such a trend suggests that farmers are of the opinion that other policies that relate to irrigation water resources have an impact on the irrigation water policy as an irrigation water management tool. As such, the water policy should clearly define how other policies are related to with regards to how water management objectives should be focused.

The relationship between the irrigation water policy and the water law cannot be underestimated. For example, there are laws that can define how private sector should be aligned, yet if the water policies in place do not accommodate private sector participation, it can lead to poor private sector participation, thus jeopardising how irrigation water is managed. Secondly, conflict-solving provisions can come as laws, but there is need for policy provisions on how to implement these provisions to solve the water conflicts effectively.

With regards to the above, farmers were probed on whether the irrigation water policy links well with the water law. Their perceptional judgement, based on scale of 0 – 10, depicted a mean value of 2.018. Such an inference could be based on the fact that after the FTLRP, no water law and/or policy reforms were put in place to address the needs of the new farmers introduced by the FTLRP. In this light, it is therefore important that the irrigation

water policy should link well with the irrigation water law, so that the two can work together in the management of irrigation water resources.

6.3 Administration variables

Water administration at scheme level should be treated as part of the rules of the game rather than as part of the players since it is concerned with implementing the legal and policy provisions at ground level. Some of these facets include conflict resolution, water rights, accountability, cost recovery mechanisms, project selection to mention a few.

In this regard, respondents were probed on irrigation water administration and the descriptive statistics are as presented in Table 6.3 below.

Table 6.3: Descriptive statistics: perceptional-based administration institutional and performance variables

Irrigation water administration variables	Acronyms	Type of data	Mean values	Standard Deviation	Range	
					Min	Max
Capacity of the administration of irrigation water at scheme level	ACIW	Scale	*6.162*	*2.242*	0	10
Effectiveness of user groups or WUAs in administration of irrigation water	AEWA	Scale	*4.733*	*2.149*	0	10
Private sector participation reduces burden on irrigation water administration and management	APPA	Scale	*5.147*	*1.240*	0	10
Mechanisms of collecting updates and do maintenance of irrigation water at scheme level	AMUM	Dummy	*0.234*	*0.108*	0	1
Adequacy, relevance and reliability of water data in irrigation water management at scheme level	AARR	Scale	*3.624*	*2.813*	0	10
Capacity to effectively administer irrigation water through use of the irrigation water law and policy	ACLP	Scale	*3.162*	*2.198*	0	10

Source: survey data (2012)

Capacity to manage irrigation water resources management is a function of many factors, including the irrigation water law and water policy and the informal societal institutions. It can also be in form of water user groups' capacity, like WUAs to manage irrigation water. As such, farmers were asked if they feel there was capacity for the administration of irrigation water at scheme level. This was based on the perceptional judgement on a scale of 0 – 10. The results revealed an average of 6.162, suggesting that most farmers were of the opinion that capacity to administer irrigation water management at scheme level existed in form of users' associations, constitutions among other issues.

However, what is important is whether such capacity is made use of, rather than just lying idle. In light of this, effective and efficient water management at scheme level can be achieved. Administrative issues should therefore ensure that administrative capacity of irrigation water is promoted and encouraged at scheme level, through the water law and water policies, taking into consideration the informal rules that users formulate for themselves on grassroots level.

In line with the above, capacity to manage water resources at scheme level also depends on how effective such capacity is. Farmers were asked their judgemental perception, on a scale of 0 – 10, how effective were the user groups or WUAs in irrigation water management to achieve efficient water management.

A mean value of 4.733 implies that farmers were of the opinion that water users groups or WUAs were fairly effective in managing water resources at scheme level. The results

concur to a study by Checkel & Alamirew (2007) that showed the overall performance of the WUAs in terms of managing the schemes was very poor and the WUAs did not have the capacity to enforce its by-laws. Similarly, a study by Shimels (2006) revealed that irrigation schemes were poorly managed in terms of water allocation and distribution and conflict management due to a lack of well-established organisational and institutional conditions. The WUAs were not well organised and found to be weak to run irrigation schemes due to lack of social relations.

In addition, as noted by Manzungu (1999), Irrigation Management Committees (IMCs) formed in 1983 to improve coordination between irrigators and water management but have not been able to take over the management of schemes because of state-applied technical measures. Furthermore, water management was also located in various ministries, hence, duplicating efforts that presented problems of responsibilities and coordination. This could have resulted in ineffectiveness of user groups to manage water resources.

However, such effectiveness can be achieved if supported by administrative issues that accommodate water user groups. Private sector participation in the administration of irrigation water resources can significantly contribute to irrigation water management. For example, private sector, like Non-Governmental Organisations (NGOs) can be actively involved in irrigation planning, development and management of water resources, in their bid to improve achieve economic development in communities. As such, they can employ their own staff to effectively monitor and supervise some of these initiatives and assist

water users to manage water resources efficiently. In light of this, it can reduce the burden of water administration and management, either on users themselves or the government at large. Thus, it was important to seek farmers' opinion on the participation of the private sector in water administration and management, on a scale of 0 – 10.

The results showed a mean value of 5.147, inclined towards the ideal situation of 10. The distribution suggests that users were of the opinion that private sector participation reduces burden on irrigation water development. However, what is important to note is the fact that private participation can only be active and visible in a conducive environment and protected with the relevant irrigation water laws. Failure to achieve such conditions may result in poor private sector participation; hence, its effect on reducing the burden on irrigation water management may not be significant. As such, water administration has to ensure active participation of private sector in irrigation water resources, thereby creating an active role for the private sector players and assist in reducing the burden on irrigation water management.

When irrigation systems dilapidate, it can significantly lead to poor irrigation water management, for example, through water loss in case of burst pipes. As such, constant and regular monitoring of irrigation systems to ensure they are functioning well. In light of this, it is therefore important for irrigation schemes to have own mechanisms of collecting irrigation water updates and doing maintenance of irrigation water. It was thus important to probe the farmers on whether they have such mechanisms scheme level. The variable was treated as a dummy, with 0 = yes and 0 otherwise.

The results of such analysis revealed a mean value of 0.234, skewed towards 0 (otherwise), suggesting that most farmers indicated that they did not have or have little of such updates and maintenance mechanisms at scheme level. Such a trend negatively impacts on irrigation water resources management some irrigation systems may dilapidate further if gone unnoticed. In addition, users may not be able to ensure an efficient water management system at scheme level due to lack of updates on how they will be using irrigation water. As such, water administration can become an effective water resources management institution if it is favourable for updates and maintenance of irrigation systems.

While existence of water updates and maintenance data is existent at scheme level, if it is not adequate, relevant and reliable, then it can jeopardise the objectives of efficient water resources management. Hence, in light of this, farmers who revealed they had such mechanisms in place were probed on whether such water updates and maintenance data were adequate, relevant and reliable. The probe was based on a perceptional judgement on a scale of 0 – 10.

The results indicated a mean value of 3.624, inclined towards the worst situation. Such a distribution suggests that farmers were of the opinion that the water updates and maintenance data were not adequate, relevant and reliable. In light of this, water administrators may not be able to know what intervention mechanisms or strategies are to be implemented in cases of need. In addition, funds may be used for purposes which they are not meant for due to lack of reliable and adequate data. Again, some users may be left

in the cold when it comes to interventions as data on the table may be irrelevant, thus negatively affecting irrigation water resources management.

Overall, farmers were asked their perceptional judgement on the capacity of water administration to effectively manage irrigation water resources through use of the irrigation water law and policy. Their judgement was based on a scale of 0 – 10. A mean value of 3.162 suggests a situation where farmers were of the opinion that the irrigation water administration had inadequate or capacity to manage irrigation water in conjunction with the irrigation water law and water policy. Such a pattern adversely affects irrigation water management objectives if the formal institutions do not complement each other with regards to irrigation water resources development and management. In light of this, it is therefore crucial to ensure that issues that overlap into any of the informal institutions under study (irrigation water law, policy and administration) are structured in such a way that they effectively complement each other to manage irrigation water resources.

6.4 Informal Water Management Institutions

The evolution of institutions and their performance implications are affected strongly by their path-dependency[24] nature. Because of their path-dependent characteristics, institutions are the 'carriers of history,' reproducing themselves well beyond the time of their usefulness (David, 1994; Coriat & Dosi, 1998). The idea of institutional change as a

[24] Path dependency means that history does matter: the direction and scope of institutional change cannot be divorced from its early course or past history.

process of ‘cumulative causation’ (Veblen, 1919) suggests not only path dependence, but also the linkages among institutions in a temporal sense.

Since informal institutions play an important role in the incremental way in which institutions evolve, they remain a major source of path dependence (North, 1990). In addition to informal institutions, there are such self-reinforcing mechanisms as network externalities, learning effects, and the historically derived subjective modelling of issues. Since all these mechanisms reinforce the current course of the development path, reversing the course of that path becomes extremely difficult or costly (North, 1990). This is also reiterated in the utility of social theory to address human problems (North, 2005b), and is concerned with explaining how to improve economic performance, and hence welfare, by comprehending human incentives, preferences, perceptions, beliefs and learning (North, 2004), especially in this study, irrigation water sector.

Informal institutions change more slowly than formal institutions. As a result, there is always tension between altered formal rules and persisting informal rules (North 1990). Informal water markets in many parts of the world lack formal water laws and policies (Easter *et, al* 1998). It is therefore important to evaluate informal irrigation water management institutions in managing water resources and the nature of relationship with the formal institutions. The objective of such an evaluation is to attempt to uncover how the two types of institutions can work to efficiently and effectively manage irrigation water resources.

Respondents were probed on the level of organisation at scheme level. Their responses were analysed and presented as shown in the Table 6.4 below.

Table 6.4: Descriptive statistics: perceptional-based informal irrigation water institutions and performance variables

Informal irrigation water institutions variables	Acronyms	Type of data	Mean values	Standard Deviation	Range	
					Min	Max
Clearly defined boundaries to withdraw irrigation water from Common Pool Resources (CPRs)	ICPR	Dummy	*0.314*	*0.238*	0	1
Existing appropriation rules related to the local conditions with regards to irrigation water management	IARL	Dummy	*0.421*	*0.162*	0	1
Mechanisms, e.g. constitutions to assist in irrigation water management at scheme level	IMSL	Dummy	*0.204*	*0.191*	0	1
Effectiveness of management mechanisms in the management of irrigation water resources	IEMM	Scale	*4.184*	*3.005*	0	10
Effectiveness of monitoring conditions and the behaviour of appropriators at scheme level	IEMA	Scale	*3.881*	*2.748*	0	10
Existence of regulation sanctions at scheme level for users who fail to act accordingly	IERS	Dummy	*0.508*	*0.263*	0	1
Existence of rapid access to conflict solving in the low-cost, local setting with regards to irrigation water management	IECS	Dummy	*0.381*	*0.024*	0	1
Users challenging the rights of appropriators to create own local-based institutions suited to own local set-up	ICRA	Dummy	*0.215*	*0.138*	0	1
Extent of challenge of the rights of appropriators to create own institution based on diverse local set-ups	IECA	Scale	*3.587*	*2.782*	0	10
Effectiveness of informal institutions to influence the irrigation water law, policy and administration	IOEI	Scale	*4.499*	*1.033*	0	10

Source: survey data (October, 2012)

CPR studies show that effective institutional arrangements for managing resource dilemmas vary depending on physical and community conditions (Lam, 1998). Effective institutional arrangements may diverge across settings, yet CPR studies have identified some general principles of long-enduring, self-governed CPR institutions. According to (Ostrom, 1990 & 1998), the first design principle associated with sustainable CPR governance institutions is the establishment of clearly delineated boundaries around the resource and resource users. Moreover, CPR theory's boundary principle implies that institutions whose boundaries are congruent with the scale of the physical boundaries of a CPR are more likely to be successful and sustainable (Ostrom, 1990).

With regards to clearly defined boundaries to withdraw water from Common Pool Resources (CPRs), a mean value of 0.314 was revealed and is skewed towards the worst situation where clear boundaries did not exist. As noted by Ostrom (1990), lack of clear boundaries of the CPR and closing it to 'outsiders', local appropriators face the risk that any benefits they produce by their efforts will be reaped by others who have not contributed to those efforts. However, Dalhuisen *et al.* (2000) argues that there is a finite amount of water that must be shared in common over a variety of uses and over geographic areas, based on the fact that water falls in the form of rain, flows and evaporates with no regard to any boundary. In addition, some CPR studies have identified general principles of long-enduring, self-governed CPR institutions by establishment of clearly delineated boundaries around the resource and resource users (Ostrom, 1990, 1998). It is therefore important that informal institutions be structured in a way that will ensure CPRs users coordinate their actions to solve supply and demand dilemmas

(Ingram *et al*., 1984; Lam, 1998; Lord, 1984; Ostrom, 1990). However, (Ostrom, 1990, 1998, 1999) highlights that CPRs exhibit varying degrees of two key characteristics, one of which is the difficulty in excluding users, as such; it will be difficult to exclude other users from accessing water resources, thus leading to free-riding problems or insufficient maintenance of water resources. Nonetheless, there should be effective conditions in place to ensure that water, as a CPR is effectively managed through the use of informal rules.

Local rules are participatory in operation; all users in the area must normally consent to the rules. They are also self-regulatory in the sense that there are low or no extra costs, so no external resources are needed to enforce and monitor them (Sokile & van Koppen, 2004). In some cases, local rights could also be sensitive to the vulnerable, e.g. widows and the poor. Customary local practices and structures can also contain or help avoid conflict. Farmers were probed whether local appropriation rules related to local set-up existed. The variable was based treated as a dummy variable, where 1 = yes and 0 = otherwise.

The results depicted a mean value of 0.421, skewed towards the worst situation where farmers indicated a lack of such- or fewer local rules. Such a trend could also be based on the fact that the irrigation sector was overwhelmed by new ‘cadres’ in the form of mainly A1s, A2 and other categories of the FTLRP of 2000 in Zimbabwe. Lack of local rules based on local conditions can result in users wasting irrigation water as there are no mechanisms that control, govern and regulate how they use water at local level. At the

same time, violations of rules and water use may go unnoticed and unpunished. Existence of informal rules based on local condition means that if the informal codes are violated, punishment may be enforced (North, 1990).

On the other hand however, Ostrom (2007) also warns on viewing any particular institutional arrangement as a panacea for solving natural resources (especially CPRs) problems due to heterogeneity and complexity of problems facing different resources, hence, the need for local-based institutions specially crafted for a given community set-up in managing irrigation water. The rules and regulations in use by a local community determine who has access to the common pool resources (CPR), what resource units authorised participants can use, at what times and who will monitor and enforce the rules (Ostrom 1999). This promotes and encourages efficient and sustainable irrigation water management.

Regulation and governing mechanisms, e.g. constitutions at scheme level can assist in the management of irrigation water resources through certain rules that users have to follow at their irrigation systems. The variable on whether management mechanisms were existent was treated as a dummy variable, where 1 = yes and 0 = otherwise.

The results showed a mean value of 0.204, skewed towards a situation where farmers indicate a lack of management mechanisms. The results concur to a study by Vandersypen *et al.* (2006) in Mali who found out that often, there was no consensus on rules among farmers and monitoring and management mechanisms were absent. The

trend could also be explained with regards to new farmers who ventured into irrigation sector during the FTLRP, where they may not have been aware of the need to create informal management mechanisms in their new set-ups. Lack of such mechanisms suggests a case where users may fail to achieve irrigation water management objectives as they do not have proper management strategies. In light of this, it is thus important to note and understand the need for informal management mechanisms at scheme levels to allow proper irrigation water management.

At the irrigation schemes where informal management mechanisms existed, it is important to also note their effectiveness to ensure efficient management of water resources at scheme level. Based on perceptional judgement, on a scale of 0 – 10, farmers were asked to offer their opinion on the effectiveness of these institutions.

The mean value of 4.184 was revealed, suggesting that most farmers were of the opinion that these mechanisms were fairly not effective. Such a pattern could be based on the FTLRP which ushered in ‘new cadres’ into the irrigation sector who may not be aware of the mechanisms behind irrigation water use and what principles to follow. It could also be explained by the lack of users organising themselves into user groups, where they would then put, in black and white, principles and rules that should be followed and how defaulters will be punished if ever they exist. In light of this, it is important to make users aware of the need of implementing effective irrigation water management mechanisms for efficient water management.

Effectiveness of management mechanisms is a factor of many variables, e.g. effectiveness of monitoring conditions and the behaviour of appropriators, regulation sanctions, among other variables. A probe, based on perceptional judgement on a scale of 0 – 10 on the effectiveness of monitoring, conditions and the behaviour of appropriators revealed a mean value of 3.881. This trend suggests that most farmers were of the opinion that the monitoring conditions and behaviour of appropriators were not effective enough to manage the irrigation water management. Such a trend could also explain why, as noted in the previous paragraph, the informal management mechanisms were not effective in managing water resources. Therefore, there is need to ensure the effective monitoring conditions and the behaviours of the appropriators to ensure all users behave accordingly and promote sustainable water management.

Existence of regulation sanctions to manage irrigation water resources can be an effective mechanism of irrigation water management. Such regulation mechanisms can be applied on users who default and fail to behave accordingly. Such a scenario can assist in achieving the irrigation water management objectives. In light of this, farmers were asked if regulation sanctions existed at scheme level, and the variable was treated as a dummy variable.

The results revealed a mean value of 0.508, slightly skewed towards the ideal situation. This suggests that most farmers indicated a fair existence of regulation sanctions at scheme level. However, it is also important to note that the existence of regulation sanctions does not imply effective irrigation water management, unless they are effective.

As such, it is therefore important to ensure that users create regulation sanctions that suit their conditions and also ensure these sanctions are effective enough to deal with irrigation water management issues.

In addition to existence of regulation sanctions, rapid access mechanisms to conflict solving without following long procedures or protocols can be an effective tool in the management of irrigation water resources. Thus, farmers were probed if such rapid conflict-solving mechanisms exist at scheme level. The variable was treated as a dummy, where 1 = yes and 0 = otherwise.

A mean value of 0.381 implies that most farmers indicated that rapid conflict conflict-solving mechanisms did not exist at scheme level. Lack of rapid conflict-solving mechanisms in a low-cost and local setting could have an adverse effect as far as irrigation water management is concerned. This encourages local users to bypass traditional mechanisms in hope of achieving a winner-takes-all decision (Sokile & van Koppen, 2004). However, formal courts seem to have tendencies to overturn informal court decisions, in turn, may exacerbate conflict at local level rather than resolve it. In addition, these channels maybe costly and users may not be able to afford the expensive and lengthy procedures to solve conflicts, as such, may leave some of the conflicts unsolved and this negatively impacts on irrigation water management objectives. As such, it is thus crucial to structure rapid conflict-solving mechanisms in the low-cost, local setting with regards to irrigation water management.

It is also important to understand that users need to create their own set of rules that governs how they behave and what principles they should follow with regards to management of water resources. As such, empowering users in formulating their own, localised set of rules is crucial in managing water resources as farmers will have confidence in their own rules and as such, their implementation may be effective enough to ensure users behave accordingly. In addition, informal rules also differ from community to community, hence, the need of local, low-cost set of rules for water users.

In light of the above, farmers were probed on whether users are in a position to come out and challenge the rights of the appropriators to create their own, local-based set of rules. Ability to challenges these rights was represented by 1 and 0 for otherwise. A mean value of 0.215 was revealed. Such a distribution is skewed towards the worst situation; implying farmers revealed that users were not in a position to challenge the issue of creating their own set of rules to govern water management. This is supported by North (1993), who notes that institutions are not necessarily or even usually created to be socially efficient, rather, they, or at least formal rules, are created to serve interests of those with bargaining power to create new rules. As such, farmers should therefore be able to challenge the rights if the appropriators and create their own rules that are of low-cost and locally-based. This is supported by Sharma (2012) who reiterates the development and creation of institutions or rules as an aid to creating more socially acceptable (and so economically acceptable) outcomes. North (1993) further notes the creation of institutions that so structure the rules and their enforcement as to alter pay-offs to induce the cooperative solutions.

Failure to create own rules also mean that farmers may not have an option but to go for the more expensive rules as they do not have the ability to challenge a set of rules in favour of their own rules. According to the transaction cost theory, the functioning of institutions depends on the costliness of enforcement (North 1990). Such a trend may result in farmers lacking confidence in the available appropriator rules and as such, may lead to using water resources wastefully as there will not be effective mechanisms that they believe in to manage irrigation water.

While ability to challenge the rights of appropriators to create own institution based on local set-ups exists, its effectiveness depends on the extent of challenge. The farmers who had revealed that they had the ability to challenge the appropriators' right to create their own set of local rules were further probed on the extent of the challenge. The perceptional judgement was based on a scale of 0 – 10.

The results revealed a mean value of 3.587, skewed towards the worst situation. Such a trend implies that farmers were of the opinion that extent of challenging the appropriators' rights was low. This suggests that farmers were weak in challenging the rights of appropriators. As such, it would thus be difficult for the farmers to create their own effective set of rapid, low cost and locally-based informal institutions to assist in the management of irrigation water resources. In this regard, it is therefore crucial that users be empowered in creating their own set of rules, especially if they could organise themselves into user groups. As user groups, they are able to at least sit down and

formulate own official informal set of rules based on their physical, social and local set-ups.

Overall, what is important is whether the informal institutions described above are effective enough to influence the formal irrigation institutions *(irrigation water law, policy and administration)* in the management of irrigation water resources. If the informal institutions can influence how the formal institutions work, it can lead to efficient irrigation water resources management. For example, informal irrigation institutions work effectively if it is accommodated within the formal irrigation institutions. Even if the formal irrigation institutions come in to manage water resources, it is important that farmers still have their own set of rules which determine how they behave and how they accept a given situation. In other words, formal rules may fail in a given set-up if it does not accommodate the informal rules in that given set-up. In light of this, the informal rules thus play a bigger role in influencing how formal rules are used to manage irrigation water resources.

In light of the above, the study sought farmers' perceptional judgement (on a scale of 0 – 10) on the effectiveness of informal institutions to influence the formal institutions. The results depicted a mean value of 4.499, inclined towards the worst situation. This implies that farmers were of the opinion that the informal institutions were not effective enough to influence how the formal institutions manage irrigation water management. While this is the case, it is important to understand that for the formal institutions to work, they draw heavily from the informal institution.

Given the relationship between the informal and formal rules as explained in the paragraph above, lack of coherence between the two set of rules would lead poor irrigation water resources development and management. A good example is where the formal rules present a set of procedures/protocol to follow in solving, say, conflicts, but this can only be effective if they also take into cognisant that farmers also have their own set of rules that guides and control how they behave. In addition, farmers also emanate from diverse social communities where a set of rules vary, as such, the formal rules structures should thus consider such discrepancies to achieve irrigation water management objectives.

6.5 Conclusion

6.5.1 Formal institutions

The preliminary findings have revealed that the formal institutions *(water law, policy and administration)* have not been effective in the management of irrigation water resources. This could be explained by the history of Zimbabwe where there were discrepancies and colonial injustices in the water sector. Further to this, the state seems to be using the same principles of water management that have been used in the past and were not aligned to the new system that prevailed in the independent Zimbabwe. Notably, the state has embarked on the land reform programmes which have ushered in new farmers in the irrigation sector. As such, the water management institutions have not been aligned to this new dispensation, which could have resulted in ineffective water management institutions.

6.5.2 Informal institutions

Despite their importance in the management of irrigation water resources, the informal rules have also been found to be ineffective in the management of irrigation water resources. This is revealed by most responses as highlighted by the farmers, as some of the regulation mechanisms at scheme level were non-existent. This could be based on the fact that most of the respondents were drawn from a pool of 'new farmers' who benefited mainly from the FTLRP and lacked some of these mechanisms that governed the use of irrigation water resources. Furthermore, failure to acknowledge the importance of informal rules in the management of water resources could also have resulted in ineffective water management institutions. However, it is important to acknowledge the crucial role that informal institutions play in the management of water resources.

The next chapter focuses on the nature of relationship between the water institutions and their variables and how significant these variables affect the effectiveness of water management institutions in governing the use of irrigation water.

CHAPTER 7 – RESULTS OF THE EMPIRICAL ANALYSIS

7.0 Introduction

According to Merrey *et al., (*2007), a series of institutional arrangements have been presented as panaceas to improve water management: strong government agencies, user organisations, and water markets. Seemingly, some of these approaches have failed to live up to expectations, largely because the variability of local situations and the difficulty of transplanting institutions from one context to another. As such, this study also analysed how significant some of these arrangements are with regards to irrigation water management.

This chapter therefore presents the regression results of the study to ascertain the nature of relationship between the irrigation water institutions and their constituent variables. In this study, the Ordinary Least Squares (OLS) is a single equation presenting the conventional conception of institution-performance interactions by postulating irrigation water management as a simple and direct function of a set of 33 variables representing the formal (irrigation water law, policy, and administration) and the informal institutional aspects.

7.1 Empirical analysis results

The relative statistical significance of the estimated coefficients of the variables is evaluated based on their *regression coefficients* at the 1%, 5% and 10%. The R^2 evaluates the explanatory power of the OLS equations and ranges between 0 (no fit) and 1 (perfect fit). However, the problems of heteroskedasticity and autocorrelation may have arisen; in which case, the Breusch-Pagan test statistic was used, having a Chi-square (χ^2) distribution. Table 7.1 shows the empirical results giving the adjusted R^2 values to explain the variation in explanatory variables. The results of the Breusch-Pagan test show whether the model captures the institution-performance linkages fits the data well and whether there is consistency with empirical reality.

The regression results for the study are as depicted in Table 7.1 below;

Table 7.1: Empirical analysis results on the nature of institution–performance linkages

Dependent Variable	Independent / explanatory variables	Acronyms	Range	
			Coefficient	*t-ratio*
IRRIGATION WATER LAW **(LIWL)**	Access to water rights	LAWR	***0.151*** **	*2.177*
	Format of water rights	LFWR	***0.083*** ***	*1.843*
	Existence of irrigation water law	LEWL	***0.728****	*2.683*
	Provisions effective for solving conflicts among irrigation water users	LCRM	***0.475*** ***	*1.617*
	Water law relevant for users under current and future situation	LRCF	-0.069	-1.189
	Water law relationship with other laws to promote water management	LLOL	0.418	*1.238*
	Water law provisions to promote private sector participation	LSPS	***0.208****	*3.491*
	Constant		**1.641***	3.019
R^2			**0.681**	
Chi-square (χ^2)			**76.521**	
Breusch-Pagan			**63.147**	

Source: survey data (October, 2012)

**Significant at 1%* ***Significant at 5%* ****Significant at 10%*

Table 7.1: continued

Dependent Variable	Independent / explanatory variables	Acronyms	Range	
			Coefficient	*t-ratio*
IRRIGATION WATER POLICY **(PIWP)**	Project selection criterion is economic orientated	PPSC	***0.098******	***1.653***
	Pay for use of irrigation water	PUIW	***-0.079******	***-1.683***
	Form in which irrigation water is paid for	PFIP	0.237	1.107
	Provisions for promoting private sector participation	PGPP	***0.091******	***1.714***
	Extensiveness of private sector participation in irrigation	PEPP	0.087	0.839
	Organised into Water Users 'Associations (WUAs)	PWUA	***0.657****	***3.218***
	Extensiveness of WUAs 'participation in irrigation water management	PEWA	***-0.181******	***-1.650***
	Provisions favourable for users' participation in irrigation	PGUP	***0.128****	***2.052***
	Effect of other policies like fiscal policies in water management	PEOP	***-0.121******	***-1.645***
	Water policy links well with water law	PWPL	***0.201****	***3.631***
	Constant		**0.918****	**2.241**
R^2			**0.702**	
Chi-square (χ^2)			**78.023**	
Breusch-Pagan			**64.818**	

Source: survey data (October, 2012)

***Significant at 1%** ****Significant at 5%** *****Significant at 10%**

Table 7.1: continued

Dependent Variable	Independent / explanatory variables	Acronyms	Range	
			Coefficient	*t-ratio*
IRRIGATION WATER ADMINISTRATION **(AIWA)**	Capacity of the administration of irrigation water at scheme level	ACIW	***1.106****	***3.886***
	Effectiveness of user groups / WUAs in irrigation water administration	AEWA	***-0.063*****	***-1.741***
	Private sector participation reduces water management burden	APPA	-0.077	-0.806
	Mechanisms of collecting updates and carry-out maintenance works	AMUM	0.093	0.904
	Adequacy, relevant and reliability of water	AARR	0.043	0.998
	Capacity to effectively administer irrigation water w.r.t law and policy	ACLP	-0.012	-0.363
	Constant		**1.248****	2.064
R^2			**0.791**	
Chi-square (χ^2)			**73.947**	
Breusch-Pagan			**67.184**	

Source: survey data (October, 2012)

**Significant at 1%* ***Significant at 5%* ****Significant at 10%*

Table 7.1: continued

Dependent Variable	Independent / explanatory variables	Acronyms	Range	
			Coefficient	*t-ratio*
INFORMAL IRRIGATION WATER INSTITUTIONS **(IFWI)**	Clearly defined boundaries to withdraw irrigation water from CPRs	ICPR	0.167	0.388
	Existing appropriation rules related to the local conditions	IARL	***0.186****	***2.238***
	Mechanisms, e.g. constitutions to assist in water management	IMSL	***0.783****	***2.724***
	Effectiveness of management mechanisms in water management	IEMM	***0.319****	***4.543***
	Effectiveness of monitoring, conditions & behaviour of appropriators	IEMA	***-0.163*****	***-1.656***
	Existence of regulation sanctions at scheme level	IERS	***0.689****	***4.891***
	Existence of rapid access to conflict-solving in a low-cost, local setting	IECS	***1.418****	***2.860***
	Users against rights of appropriators to create local-based institutions	ICRA	0.278	1.019
	Effectiveness of users against rights of appropriators	IECA	0.181	1.033
	Effectiveness of informal institutions on law, policy & administration	IOEI	0.127	1.203
	Constant		**1.613****	**2.186**
R^2			**0.817**	
Chi-square (χ^2)			**76.377**	
Breusch-Pagan			**69.691**	

Source: survey data (October., 2012)

**Significant at 1%* ***Significant at 5%* ****Significant at 10%*

Table 7.1 continued:

Dependent Variable	Independent / explanatory variables	Acronyms	Range	
			Coefficient	*t-ratio*
INFORMAL IRRIGATION WATER INSTITUTIONS **(IFWI)**	Irrigation water law	LIWL	**0.173*** **	1.677
	Irrigation water policy	PIWP	**0.314***	4.612
	Irrigation water administration	AIWA	**0.279****	2.160
	Constant		**1.781***	3.985
R^2			**0.768**	
Chi-square (χ^2)			**91.231**	
Breusch-Pagan			**73.453**	

Source: survey data (October, 2012)

**Significant at 1% **Significant at 5% ***Significant at 10%*

7.2 Formal institutions

7.2.1 Legal variables

Five variables were found to be significant, 2 at the 1% level, 1 at the 5% level and 2 at the 10% level. The effectiveness of the water law to manage irrigation water significantly depends on its ability to address the issue of water rights. A positive *regression coefficient of 0.151* at the 5% significance level suggests that access to irrigation water rights significantly strengthen the irrigation water law in the management of water resources. This also implies that an increase by one unit point results in a 0.151 increase the effectiveness of the water law to manage irrigation water resources. Demsetz (1967) and Coase (1960) argue that private property rights is the most efficient system of land use and the same argument can be borrowed for water use and management. Similarly, North & Thomas (1977) support such an inference by arguing that property rights provide incentives to encourage development and cultivation.

However, it is also crucial to note that the format of water rights also strengthen the effectiveness of the water law to manage irrigation water resources. This is explained by the positive relationship between the water law and the format of water rights with a *regression coefficient of 0.083* at the 10% significance level. A one unit increase in the explanatory variable leads to a 0.083 increase in the effectiveness of the water law to ensure efficient management of water resources. Unclear/scattered or lack of format rights, for example, may result in the water law failing to effectively manage irrigation water resources as it increases risks and transaction costs (Coase, 1960). Lack of clear water

rights or scattered water rights do not instil a sense of ownership to farmers, a demotivating factor; hence, it is a disincentive for farmers to participate in effective agricultural water management.

In his critique of instrumental rationality to further support the importance of institutions, Engle *et al.,* (2007) argued that the human mind fails to deliberately and analytically process all available information to choose an action that maximises utility. It simply relies on routines, rules and roles when deciding what to do in a given situation. In light of this, knowledge of the existence of the water law amongst farmers is crucial. The study revealed that knowledge of the existence of the water law positively and significantly strengthens the effectiveness of the irrigation water law as indicated by the *regression coefficient of 0.728* at the 1% significance level. The results suggest that if the explanatory variable is increased by one unit, there is a proportional increase by 0.728 in the effectiveness of the water law to manage irrigation water resources. This implies that if people are made aware of the irrigation water law and how it assists in the management of irrigation water resources, it increases the capacity of the water law to effectively manage water resources. Lack of knowledge implies individuals have incomplete information and limited capacity to process information (North, 1993), thus it is necessary to educate farmers about the water law. This also implies unruly farmers are aware of the legal consequences and punishments for inefficient use of water resources.

In addition, the water law also lays down the principles that govern irrigation water use, as such, farmers will opt to avoid punishments by behaving according to the laid down

principles. Hence, it is important for farmers to be aware of the principles that regulate the use of irrigation water through educating them on the water law and its relevance to their given setting. Farmers will also know the protocols they should follow to solve any conflicts. Based on the knowledge of the water law, farmers may also choose an alternative that maximises their personal preferences and make decisions that lead to efficient outcomes (Eggertsson, 1990; Williamson, 2008a)

The research findings have revealed that if the water law provide for conflict-solving, this positively and significantly strengthen the effectiveness of the water law in the management of water resources. This is explained by a *regression coefficient of 0.475* at the 10% significance level, suggesting that a one point increase in the explanatory variable will result in a 0.475 increase in the effectiveness of the water law in managing irrigation water resources through conflict-solving provisions. Effective conflict-solving provisions within the water law will ensure that certain protocols are followed without any bias towards the parts concerned. As such, if they are effectively implemented, it can lead to effective irrigation water law.

Private sector participation in the irrigation sector can have an effect on how water resources are managed. As such, a water law that favourably provide for private sector participation can effectively manage water resources. A positive relationship, with a *regression coefficient of 0.208* at the 1% significance level implies that provisions for private sector participation significantly strengthen the irrigation water law. A one point increase in the explanatory variable leads to a 0.208 increase in the effectiveness of the

water law to manage water resources. Clearly defined provisions that allow private sector to effectively participate agricultural water resources development and management can lead to effective water management, based on the fact that some private sector players may offer specialised services in irrigation water management, for example, some are better placed when it comes to water resources planning, development, management, funding, training etc. As such, if the water law provides for private sector participation, it becomes an effective institution in managing agricultural water.

7.2.2 Policy variables

Lack of enabling policies and effective institutional frameworks are major contributors towards poor management and utilisation of irrigation water (Namara *et al.,* 2010). This section therefore presents an analysis of some policy issues that are used in irrigation water management and their overall influence on the performance of the irrigation water policy to manage irrigation water.

The study findings revealed that the irrigation water policy is positively related to the criteria on how irrigation projects are selected (*regression coefficient of 0.098 at the 10% significance level)*. The results imply that a one unit point increase in the explanatory variable leads to a 0.098 increase in the effectiveness of the water policy to manage irrigation water resources. This suggests that project selection criterion significantly strengthens the effectiveness of the water policy to manage irrigation water resources. For example, if the irrigation water policy clearly defines selection of projects based on

economic growth and development objectives, the water policy will become an efficient and effective water management institution. This could emanate from the fact that once irrigation development projects become economic-oriented, efficient methods of allocating scarce resources, in this case, water, under market conditions comes into effect.

The results of this study revealed a negative relationship between the effectiveness of the irrigation water policy and users paying for irrigation water, as shown by *regression coefficient of -0.079* at the 10% significance level. The results suggest that if an explanatory variable is increased by one unit point, it will lead to a decrease in the effectiveness of the water policy to manage irrigation water resources. The implication in this case is that if the irrigation water policy has clearly specified clauses on users pay principles, then it can significantly lead to effective irrigation water management. This is because users may not be able to skip the payments as doing this may lead to disciplinary actions as specified by the irrigation water policy and water law.

The negative relationship revealed between the effectiveness of irrigation water policy and payment of water use could be explained by the fact that the most farmers are not paying for irrigation water use as has been discussed in the previous chapter. This implies that while a significant relationship exists between the two variables, failure of farmers to pay for water use negatively affects the effectiveness of the irrigation water policy to manage agricultural water, hence, may lead to poor irrigation water management.

There is a positive relationship between the effectiveness of the irrigation water policy and availability of provisions promoting private sector participation within a water policy as revealed by a *regression coefficient of 0.091* at the 10% significance level. The effectiveness of the water policy to manage irrigation water resources by promoting private sector participation increases by 0.091 if there is an increase by one unit point in the explanatory variable. The implication is that if a water policy clearly defines and favours private sector participation in water resources development and management, it increases its effectiveness in managing agricultural water. Unfavourable provisions may discourage private sector participation and in the long, may potentially lead to ineffectiveness of the water law to manage water resources due to loss of, for example, expertise in specific fields.

Organisation of farmers into Water User Associations (WUAs) positively and significantly strengthens the effectiveness of the irrigation water policy to manage irrigation water. This has been revealed by a *regression coefficient of* 0.657 at the 1% significance level. Increasing an explanatory variable by one unit point leads to an increase in the effectiveness of the water policy to manage water resources by 0.657 if farmers organise themselves into groups. If farmers organise themselves into WUAs, there is a high possibility that they can will be efficient and effective irrigation water management. As such, favourable clauses within the irrigation water policy promoting and supporting users to organise themselves into users groups will go a longer way in sustaining efficient irrigation water use. WUAs may have to enforce the use of restricted rules and regulations.

In addition to the above, it is important to note that if the WUAs do not extensively participate in irrigation water management; this may derail the objectives of achieving effective irrigation water management. The empirical results of the study showed a negative relationship *(regression coefficient of -0.181 at the 10% significance level)* between the effectiveness of the water policy and the extent to which WUAs participate in agricultural water management. Lack of provisions for effective participation of WUAs in the management of water resources will reduce the effectiveness of the water policy to manage water resources by 0.181 given a one unit point increase in the explanatory variable. The existing significant relationship implies that if the water policy allows for extensive WUAs participation, it can be an effective water management institution in agricultural water management. As such, the policy should take into cognisant the WUAs operations and activities at irrigation schemes and promote and support their existence as this can significantly lead to sustained irrigation water management.

The negative relationship revealed in this research study could imply that the WUAs have not been extensive in irrigation water management. If the irrigation water policy promotes organisation of the farmers into user groups and/or WUAs, and allows for extensive participation of the users, it can effectively lead to sustained irrigation water management.

However, it is important to note that if the water policy is not supportive of the users' participation; this may lead to inefficient use and management of irrigation water resources. A positive *regression coefficient of 0.128* at the 5% significance level implies that provisions that favour users' participation gives birth to an effective irrigation water

policy that will ensure efficient and sustained agricultural water management. Increasing an explanatory variable by one unit point will lead to a 0.128 increase in the effectiveness of the water policy to manage irrigation water, given that water policy supports users' participation in the management of water resources. In light of this, an effective water policy should thus define conditions which will favour and promote users' participation in water resources management.

Other economic policies related to irrigation water resources development and management, e.g. fiscal policies, can significantly contribute to effective irrigation water management. However, the results of this study revealed a negative and significant relationship between the irrigation water policy and its relationship with other economic policies *(regression coefficient of -0.121 at the 10% significance level)*. A negative relationship between the irrigation water policy and related economic policies reduces the effectiveness of the water policy to manage irrigation water resources by 0.121 if an explanatory variable is increased by one unit point. This implies that if the other polices do not support and do not work in conjunction with other policies; agricultural water will be ineffectively managed. The negative relationship depicted could imply that the other economic policies are not supportive of the- and do not work hand-in-hand with the irrigation water policy. Such a relationship leads to an ineffective water policy as a water management institution and as such, the irrigation water policy should clearly define its relationship with other economic policies and how they can be structured and networked to work together to promote effective water resources management.

The linkage between the irrigation water- policy and law revealed a positive and significant *regression coefficient of 0.201* at the 1% significance level. Increasing an explanatory variable by one unit point increases the effectiveness of the water policy by 0.201 to manage irrigation water resources if the irrigation water law and policy work in harmony. This suggests that if the water law relates well to the water policy, it will lead to an effective irrigation water policy that will ensure efficient and sustained water resources management. This implies that water management issues addressed in the irrigation water policy should accommodate the relevant water management issues included in the water law and *vice-versa* is true.

7.2.3 Administration variables

Administration of water involves implementing issues addressed in the irrigation water law and policy at ground level. As such, it is thus important to analyse and describe the relationship between irrigation water administration and the explanatory variables within water administration.

There is a positive relationship between overall irrigation water administration and administration capacity at scheme level as revealed by a significant *regression coefficient of 1.106* at the 1% significance level. A one unit point increase in the explanatory variable increases water administration institution's capacity to manage irrigation water by 1.106. Such a relationship means that if administration capacity exists at irrigation schemes, this strengthens overall irrigation water administration as a water management institution. This

implies that for water administration to be effective at scheme level administration capacity should be addressed in administration related issues. This can include capacitating farmers with administration roles, e.g. promoting organisation of farmers WUAs at scheme level.

The empirical results of this study revealed a negative relationship between overall irrigation water administration and the effectiveness of user groups or WUAs in the administration of irrigation water. A significant *regression coefficient of -0.063* was revealed at the 10% significance level. If the irrigation water administration institution does not allow for effective user/WUAs administration, its effectiveness decreases by 0.063 given a one point increase in the explanatory variable. This therefore implies that for water administration to be an effective institution in managing irrigation water resources, conditions and administration issues should promote effectiveness of users to manage water resources. For example, the WUAs can formulate farm plans for the area, market local produce and distribute farm inputs, formulate rules for the maintenance of irrigation infrastructure, devise procedures for the distribution of water, and impose and collect irrigation fees (Samad 2002). A negative relationship observed could imply that currently, water users are not effective enough in the management of water resources. In light of this, it is thus important to lay down conditions and provisions that will promote user groups or WUAs to effectively administer agricultural water resources, particularly at scheme level.

7.3 Informal water institutions variables

Informal irrigation water institution can be an effective irrigation water management tool provided local appropriation rules related to local conditions exist. Runge (1986) argues that people will cooperate for their common good without provision of external (state) coercion. In light of this, a positive *regression coefficient of 0.186 a*t the 5% level was revealed between the effectiveness of informal irrigation institution and the existence of localised appropriation rules. The results imply that an increase in the explanatory variable by one unit point increases the effectiveness of the informal institution in managing water resources through formulating local rules accustomed to the local conditions. Such a positive and significant relationship suggests that creating local rules that are locally-based makes informal irrigation institution effective in the management of agricultural water at scheme level. Nabli & Nugent (1989) argues that institutions contain an element of predictability as institutionalised rules and norms hold a certain level of stability.

In addition, as institutions change, societies adjust themselves accordingly to adapt to the changes (Shah *et al.,* 2000; Williams, 1999) thus maintaining stability at scheme level. Localised appropriation rules ensure that users behave according to locally defined rules and regulations, failure of which punishments will be executed upon the offenders as may be defined by the rules.

However, it is important to note that if these appropriation rules or conditions are not monitored effectively, this may derail the objective of the informal rules to manage water

resources effectively. This has been revealed by a significant *regression coefficient of -0.163* at the 10% significance level. A one unit point increase in the explanatory variable results in a decrease by 0.163 in the effectiveness of the informal institutions in managing irrigation water if the local rules are not monitored effectively. This implies that the informal institutions become effective water management institution if the created local rules are effectively monitored. Effective rules encourage members to co-operate towards a group strategy because they provide certainty about expected actions of others (Runge, 1981 & 1986). However, a negative relationship could imply that effective monitoring of appropriation rules at scheme level was non-existent, and this trend negatively affects the effectiveness of informal rules to manage agricultural water resources. In this regard, it is therefore crucial to monitor the rules that farmers create to govern and regulate irrigation water use.

Some mechanisms like constitutions, for example, can be effective tools of implementing localised appropriation rules and effectively monitoring them. In light of this, the analysed empirical results revealed a positive *regression coefficient 0.783* at the 5% level. The relationship depicted in the results imply that if there is an increase in the explanatory variable by one point, it leads to a 0.783 increase in the effectiveness of the informal institutions in managing irrigation water through constitutions that ensure localised rules are implemented. The significant relationship depicted also implies that the informal rules become effective tools in water resources management if regulation mechanisms are existent at scheme level. If such management mechanisms are created and related to

local conditions, then users will behave accordingly, thus promotes the effectiveness of informal rules to manage water resources.

However, if the management mechanisms are not effective in managing water resources, this can derail efforts to use informal irrigation institutions to manage water resources. Effectiveness of management mechanisms positively and significantly strengthens the effectiveness of formal rules in managing agricultural water resources. This has been revealed by a *regression coefficient of 0.319* at the 1% significance level. This relationship imply that if an explanatory variable is increased by one unit point, the effectiveness of the informal institutions in managing water resources increases by 0.319, given that management mechanisms are effective in assisting in the management of water resources. The results suggest that the more effective the management mechanism, the more effective the informal rules become in the management of irrigation water resources. Therefore, it is crucial to ensure that the management mechanisms that are created have conditions that ensure their effectiveness, thus making informal rules effective in managing agricultural water resources.

Effectiveness of management mechanisms can be defined by existence of regulation sanctions at scheme level, as these become a basis for dealing with users who may fail to behave according to the rules as defined by the management mechanisms. A positive and significant relationship has been revealed between effectiveness of informal irrigation institutions and existence of regulation sanctions at scheme level, as shown by a *regression coefficient of 0.689* at the 1% level. Existence of regulation sanctions increases

the effectiveness of the informal institutions to manage irrigation water by 0.689 given a one unit point increase in the explanatory variable. The implication being that existence of regulation sanctions ensures informal rules become an effective and efficient tool in managing water resources.

The capacity to rapidly solve conflicts in a local setting, at low costs at scheme level means that informal rules can become an effective institution in managing irrigation water resources. Existence of rapid access to conflict-solving in a low-cost and local setting positively and significantly strengthens the effectiveness of formal rules to manage agricultural water resources. This has been revealed by a *regression coefficient of 1.418* at the 1% significance level. Capacity to solve conflicts in local setting ensure a 1.148 increase in the effectiveness of the informal water institutions in managing irrigation water, given a one unit point increase in the explanatory variable. This implies that farmers may simply solve their conflicts at scheme level than attempting to follow the formal channels to courts, which may take long to solve such conflicts. In this regard, it is therefore important to promote rapid conflict-solving at schemes to effectively manage agricultural water resources through informal rules.

7.4 Informal institutions versus formal institutions

Informal and formal institutions are closely linked and greatly depend on each other. However, the informal institutions have remained largely independent of formal irrigation water institutions and operated at the periphery of the formal institutions. Several studies

have acknowledged the fact that informal local level institutions can make a difference in water management (Bruns & Meinzen-Dick, 2000; Bruns & Meinzen-Dick, 2003; Maganga, 2003; Mwakaje & Sokoni, 2003; Shah *et al*., 2001; Sokile *et al*., 2003; Van Koppen, 2003).

It is therefore important to note that analysing the relationship between the informal institutions and the formal institutions in irrigation water management can provide valuable insights for designing holistic institutional mechanisms needed for filling the vacuum existing at grass-root level of irrigation water management.

In light of the above, the nature of the relationship between each facet of the formal institutions (law, policy and administration) was analysed against the informal rules. This was to clearly evaluate the nature of relationship that exists between the informal rules and the formal rules.

The irrigation water law positively and significantly strengthens the effectiveness of the informal rules to manage agricultural water resources as revealed by a *regression coefficient of* 0.173 at the 10% significance level. Embedding water law provisions within the informal institutions increases the effectiveness of the informal institutions in managing irrigation water resources by 0.173; given a one unit point increase the explanatory variable. This implies that the farmers may make use of clauses that are embedded within the water law to regulate and govern the use of irrigation water resources. For example, farmers may adopt the principles on which water rights are allocated to farmers, and from such, they can create their own rules that are aligned to such principles. In light of this,

favourable formal rules created at the top should also consider and accommodate the strength of informal rules formulated at the ground level. This means that the informal rules can become effective tools in managing irrigation water resources; provided the formal institutions take into cognisant the existence of social rules that govern the behaviour of users at scheme level. For example, the water law may formulate a set of rules for users who fail to abide by the given laws, yet at ground level, users have their own mechanisms and rules that they may want to use to punish irritant users. As such, formal rules should be formulated in a way that they work together with the informal rules.

The irrigation water policy variable has been found to positively and significantly strengthen the effectiveness of the informal rules to manage the water resources. This has been revealed by a *regression coefficient of 0.314* at the 1% level. A one unit point increase in the explanatory variable increases the effectiveness of the informal institutions in managing water resources by 0.314 if the water policy takes into cognisant the local conditions under which users operate. Such an inference suggests the water policy formulated to manage irrigation water resources should also accommodate the informal rules, for example, policies that may promote and empower organisation into WUAs or user groups (as they can formulate own localised rules that govern their activities) to ensure they effectively participate in the management of irrigation water resources. In addition, it is important to take note that policies are mainly made and implemented for humans, and their success depends on the behaviour of the same humans, who have their own beliefs, norms and rules that govern their behaviour. Thus, in as much as

irrigation water management is concerned, such a consideration needs to be taken on board.

Lastly, but not least are the formal rules that administer irrigation water management. While administration of water management involves implementing the irrigation water- law and policy at ground level, and given that positive and significant relationships have been depicted between water law and policy, the relationship between the informal rules and water administration thus should not be underestimated.

The same analysis has also depicted a positive and significant relationship between the irrigation water administration and the effectiveness of informal rules, based on a *regression coefficient of 1.781* at the 5% level. A one unit point increase in overall administration of water resources leads to an increase by 1.781 in the effectiveness of the informal institutions to manage irrigation water resources if capacity to administer the management of irrigation water through informal rules is promoted. This implies that the informal rules become effective in managing water resources if they work in conjunction with overall administration of agricultural water, especially given that administration of water resources happens on the ground level, where social rules may be highly dominant. This suggests that in as much as the formal administration rules try to manage irrigation water resources, there are also informal rules at the ground level that will overall govern and determine how users manage their own irrigation water resources in their given local setting. A case in point is where formal rules may implement administration rules that may benefit users who are not inhabitants of a given community, yet the users of such a

community may have their own rules that exclude them. In light of this, the research findings can confirm the need for formal administration rules to incorporate a set of informal rules in a given local setting to effectively manage irrigation water resources.

7.5 Conclusion

7.5.1 Formal institutions

Five out of the seven variables were found to be significant, 5 at the 10% level. The variables that were found to be positively significant at the 10% level included the following; access to water rights, format of water rights, aware of the existence of the water law, availability of provisions for solving conflicts among irrigation water users, water law provisions to promote private sector participation, water law provisions to promote private sector participation in irrigation water resources management. Given that the water law comes into play to implement issues that have been addressed in the water policy, it is therefore crucial for the water law to effectively consider effective implementation of these aspects, particularly addressing meeting needs of the new farmers so as to achieve efficient and sustainable agricultural water management.

The explanatory variables that have been found to significantly impact on the water policy to manage agricultural water included the following; project selection criterion, paying for use of irrigation water, impact of policies for promoting private sector participation, organisation of farmers into WUAs, extent of WUAs participation, effect of other economic policies, e.g. fiscal policy on water policy and the linkage between the water policy and the

water law. The water policy basically should provide a favourable environment that addresses the issues as discussed in this paragraph, and most importantly, should link and coordinate well with other socio-economic polices and socio-economic law to achieve and promote agricultural water management.

The variables that have been found to have a significant relationship with water administration were only 2 and these included; administration capacity and effectiveness of user groups in irrigation water administration. Taking into consideration that most issues addressed in the water policy and water law are implemented at ground level through administration, it therefore implies that capacity to administer agricultural water should be encouraged in a conducive environment that will provide for all stakeholders to partake in activities related to agricultural water resources development and management.

7.5.2 Informal water institutions

Eight variables were found to have a significant influence on the informal institution as a tool for effective management of agricultural water and these included; existing local appropriation rules suited to local conditions, management mechanisms, e.g. constitutions, effectiveness of management mechanisms, effectiveness of monitoring conditions and the behaviour of appropriators, existence of regulation sanctions, existence of rapid access to conflict-solving, effectiveness of users to challenge the right of appropriators in creating own local rules and effectiveness of informal institutions to influence the formal institutions. The above discussion therefore calls for amalgamation of the informal

institutions into formal institutions as the issues that have been found to significantly impact on informal institutions seem to be effective at ground level to manage agricultural water. As such, policy reforms are needed that will regard the role, importance and significance of the informal institutions in managing water resources.

7.5.3 Informal institutions versus formal institutions

The results have depicted positive and significant relationships between the informal institutions and the formal institutions with respect to the water law, water policy and water administration. This implies that the formal institutions draw heavily from the informal institutions for them to be effective in managing agricultural water, hence, they cannot be ignored.

CHAPTER 8 - CONCLUSIONS AND POLICY RECOMMENDATIONS

8.0 Introduction

This chapter presents the main conclusions of the research study. In addition, policy recommendations are also formulated. The main thrust of institutional change within the irrigation water sector is to enhance the capabilities and increase the readiness of policymakers to solve the current and future agricultural water resources challenges with regards to their development and management. Given this thrust, the major goals of institutional initiatives in the water sector are transparent and these may include:

- Treating water as an economic good where prices are attached to use of irrigation water,
- Inculcating the payment culture,
- Promoting effective, sustainable decentralized decision structures.

However, institutional reform of the magnitude required to achieve these goals is a daunting challenge in Zimbabwe, particularly with ineffective, irrelevant and poorly functioning irrigation water institutions. The issue of how to effect irrigation water institutional change within the constraints and opportunities of political economy continue to remain elusive to both researchers and policymakers as most irrigation farmers still

remain disadvantaged with regards to irrigation water resources development and management.

The identification of a strategy for irrigation water institutional reform with minimum transaction costs and maximum political acceptability requires sharp understanding of the analytical and operational linkages among the components of irrigation water institutions and their ultimate impact on irrigation water sector performance.

However, it is important to note that institutions typically change incrementally rather than in discontinuous fashion (North, 1990). Even if some quick change is anticipated by a new policy or law, it is fairly common that the society adopts it slowly. The main reason for this incremental change is that there are many institutional elements which are interconnected, and a change gets cushioned by many other established institutional elements. Nonetheless, the important issue that then lies for policy makers is to ensure some policy issues that are recommended are put on the table for consideration, especially in Zimbabwe where policy changes are imminent due to new users in the irrigation sector.

8.1 Conclusions: Preliminary findings

8.1.1 Formal institutions

8.1.1.1 Legal institutions

The results have indicated that most of the farmers do not have access to water rights, while most of the farmers who had access to the water rights had unclear/scattered water

rights. Most of the farmers have also acknowledged that they were not aware of the existence of the water law, yet those who were aware of its existence; they indicated lack of provisions for conflict-solving and does not provide for effective private sector participation. With regards to the relevancy of the water law for the current and future situations, the farmers were of the opinion that it was not relevant and the water law was not related to other economic laws, e.g. energy and environmental laws.

8.1.1.2 Policy institutions

Farmers indicated that when projects are selected for implementation, they are not economic-oriented. In addition, farmers do not pay user fees, while those who acknowledged that they pay user fees do so based on partial recovery. Farmers have also highlighted that the water policy did not provide a conducive environment for private sector participation and for those who participate; the extent of participation was low.

With regards to the water policy promoting organisation of farmers into user groups/WUAs fewer farmers were however organised into user groups, yet the extent of user groups is limited. This is because of the water policy that does not have clear provisions for user participation, especially noting that most of these farmers are new in the irrigation sector. Other economic policies, e.g. the fiscal policy have been found to have an impact on the water policy with regards to irrigation water management. However, most farmers are of the opinion that the water policy does not relate well with the water law. This could be

explained by the launch of the FTLRP which calls for water law and policy reforms to cater for the new farmers who benefited from the FTLRP.

8.1.1.3 Administration institutions

Most of the farmers have indicated that capacity to manage water resources existed at irrigation schemes; however, the user groups/WUAs were not effective enough to administer water resources. While private sector participation can be of great importance to administration of agricultural water at scheme level through training programmes, funding, etc., however, the extent of private sector participation was low.

Collecting and keeping update and maintenance water data can assist in directing resources where they are greatly needed with regards to irrigation water management. However, it has been revealed that most farmers do not keep update and maintenance water data. Where farmers collect and keep water data, most farmers indicated that this data was of no use as most of it was not adequate, relevant and reliable. Overall, the farmers were of the opinion that water administration did not have the capacity to manage water resources through use of the irrigation water law and policy. In simple terms, there is no linkage between water administration and the water law and policy. Lack of association between the water law and policy has implications on administration since implementation of the latter institutions at ground level is accomplished through administration, as such, if the two do not relate, then administration will fail.

8.1.2 Informal institutions

Most of the farmers have indicated that there were no clear boundaries to withdraw water resources from the CPRs, and this has been also compounded with lack of local appropriation rules at scheme level to regulate activities related to agricultural water management. In addition to local rules, users may have management mechanisms, e.g. constitutions. In this study, most farmers have indicated a lack of some of these management mechanisms, and where they existed, they were said to be ineffective. Monitoring conditions and the behaviour of appropriators at scheme levels was not effective, probably owing to lack of effective management mechanisms and regulation sanction to control activities at irrigation schemes.

With regards to rapid conflict-solving mechanisms, most farmers have highlighted that they were not existent at their schemes. The users did not have the ability to challenge the rights of the appropriators to create their own local rules suited to their local conditions, and for the few who are able to challenge the rights of the appropriators to create their own local rules, the extent to which they challenge is ineffective and limited. Lastly, most farmers have highlighted that the informal institutions did not influence the formal institutions in managing water resources maybe because of the fact that the informal institutions are ignored and neglected. They are not regarded as instruments for effective irrigation water management, hence the lack of influence of the informal institutions on formal institutions.

8.2 Conclusion: Empirical analysis

The empirical results provide us with ample insights into the relative role and significance of institutional aspects in determining the performance of irrigation water institutions.

8.2.1 Formal institutions

8.2.1.1 Legal institutions: Role and significance

The 6 institutional constituent variables that have been found to significantly contribute to the effectiveness of the irrigation water law to manage irrigation water resources included;

- Access to water rights
- The format of the water rights
- Awareness and knowledge of the water law and its provisions
- Existence of effective provisions for solving conflicts among irrigation water users
- Relationship of the water law with other economic laws that promote irrigation water management and
- Water law provisions that promote private sector participation

8.2.1.2 Policy institutions: Role and significance

With regards to policy institutions, 8 institutional constituent variables that have been found to significantly contribute to the effectiveness of the irrigation water policy to manage irrigation water resources included;

- Project selection criterion being economic oriented
- Paying for use of irrigation water
- Favourable policies for promoting private sector participation
- Organisation of farmers into Water Users Associations (WUAs)
- The extent to which WUAs participate in irrigation water management
- Favourable policies for users' participation in irrigation water management
- Impact of other policies, e.g. fiscal policies on the water policy
- The linkages between the water policy and the water law

8.2.1.3 Administration institutions: Role and significance

Only 2 institutional constituent variables that have been found to significantly contribute to the effectiveness of the irrigation water administration to manage irrigation water resources included;

- Capacity of the administration of irrigation water and
- Effectiveness of user groups/WUAs in irrigation water administration

8.2.2 Informal institutions: Role and significance

The informal irrigation institutions have also been found to have a significant impact on the management of irrigation water resources. This has been evidenced by 8 explanatory

variables that have been found to significantly impact on the informal institutions to manage irrigation water resources. The significant variables included;

- Existence of appropriation rules related to the local conditions
- Availability of mechanisms, e.g. constitutions to assist in irrigation water management
- Effectiveness of these mechanisms in irrigation water management
- Effectiveness of monitoring conditions and the behaviour of appropriators
- Existence of regulation sanctions at schemes
- Existence of rapid access to conflict-solving in a low-cost, local setting
- Effectiveness of users to challenge the rights of appropriators to formulate locally-based institutions and
- The influence of the informal institutions on the irrigation water law, policy and water administration.

8.2.3 Informal institution versus formal institution: Role and significance

Informal institutions have been found to have direct and significant relationship with the irrigation water law, water policy and water administration. The implication of such a relationship is that the way in which formal water institutions should attempt to accommodate the informal institutions so that they are effective in managing water resources.

8.3 Policy recommendations and insights

The following are policy recommendations and insights for policy-makers with regards to achieving sustainable irrigation water management.

8.3.1 Irrigation water law

This study contends that any attempt to reform the water sector with the view to improve productive uses of water in rural areas, must confront the historical legacy of inequalities of access to land and water, which has perpetuated under the FTLRP. One way of attaining this is to promote wide-scale participation of all stakeholders in the debate about the water reform, its principles and objectives over a long period of time. This will also entail seeking policy suggestions from all stakeholders, particularly the poor, on how water policy can be improved. Such an approach will break the stranglehold that government and donors have on the water policy-making process.

In addition, issuance of water permits to water users where it applies will go along promoting sustainable and efficient use of irrigation water resources. Water rights also give farmers the sense of ownership and sense of belonging to water user groups and as such, would use water in a sustainable and efficient manner. In light of this, the irrigation water law should ensure it has clear provisions for the issuance of water rights, especially to deserving users.

The water law should define clearly the provisions that will promote private sector participation. Active private sector participation in irrigation water resources development and management can assist in introducing new technologies, technical support and extension services to water users and in training water users in irrigation water resources development and management.

In general, existing property rights over water may not be the most appropriate from equity and efficiency perspectives. Any new water right should guarantee that the farmers get water of the desired quality and quantity at the required time. As the WUAs are strengthened, it is essential to revise the enabling framework and water rights systems including land rights in order to secure efficient and equitable water allocations.

8.3.2 Irrigation water policy

In the Zimbabwean context, this study suggests that the water reform must be linked, in innovative ways to the FTLRP, which was aimed at providing access to productive land to rural people for livelihood improvement. It is the combined access to productive land and water, that water can be productively used to alleviate poverty and contribute to economic growth.

In the corollary of the above, it can also be stated that although access to fertile land is crucial to productive uses of water, new water users need access to a broad portfolio of other assets central to the productive use of water. These include, among many others,

functioning irrigation technology and infrastructure. A dilapidated irrigation infrastructure underlies a lack of access to water for irrigation. A post-crisis water reform policy may need to have a broad conceptualisation of access to water that covers technological problems affecting the smallholder irrigation sector, and new water users more generally. Accordingly, a new water policy should focus on various issues related to irrigation technology, such as the development, provision and maintenance of relevant low-cost irrigation technology to communal farmers.

Local level institutions of irrigation water management must be dynamic and flexible enough to engage and incorporate 'new' institutions representing 'new farmers' but also robust enough to ensure that there is effective communication and debate on water issues.

One major issue is the politicisation of access to, and management of water partly as a result of, the politics that surrounded the FTLRP. The dominant political narrative that accompanied the FTLRP had the attendant effect of overt politicisation of access to water, with local political organisations of, for example, A2 farmers using 'new' institutional routes of water management, by-passing decentralised institutions of water management (Section 2.2.6), thereby undermining the effective functioning of ZINWA, catchment and sub-catchment councils. Yet, on the other hand, and regardless of the adverse effects such politicisation had on water reforms, this may provide opportunities for holding decentralised institutions of irrigation water management accountable to water users, and for providing voice to water users, as well as aligning politics and the water policy.

The irrigation water policy should encourage and promote user groups for water users. For example, once farmers are organised into user groups, every beneficiary of irrigation water should be a member of a particular irrigation water user group, e.g. Water Users Associations (WUAs). This would imply that all users follow guidelines that are given within a user group, failure of which they will be punished according to set rules and/or procedures. This would lead to efficient irrigation water management.

The water policy should provide greater local control of water charges at local level water development. Revenue raised could also be used in funding water development projects and repair and maintenance of irrigation infrastructure within communal irrigation schemes. Therefore, there is need for clear a policy that inculcates a culture of paying for commercial irrigation water and ensuring water revenue is re-invested in water resources development and management. In addition, the policy should ensure the establishment of a water pricing structure consistent with cost and social efficiency.

8.3.3 Irrigation water administration

The government should intervene to encourage, promote and strengthen Water User Associations (WUAs), e.g. formation of effective, farmer-defined WUAs, so that they can accomplish their mandates without difficulties or interferences and ensure they are capacitated to administer irrigation water. There is a need to strengthen WUAs so that they deal with not just water allocations but undertake the complex tasks of financial management and technical support to communities to ensure sustainable management of

irrigation resources. These capacities were weak in most WUAs, and governments need to improve skills and knowledge to enhancing local administrative, managerial, and financial capacities of participants. In addition to this, water administration issues should ensure promotion of farmer managed and operated systems as this instils a sense of ownership in managing their irrigation systems, so is water. In addition, the policy should cater for co-opting of new settlers in water management structures and processes to ensure their cooperation.

The water legislation should provide for user pay principles to fund administrative and participatory functions. Moreover, there is also need of strengthening local water management where stakeholder and local participation is promoted and establishing effective institutional structure and strengthening new water institutions.

Water administration issues should encourage better coordination between public-public and public-private sector bodies. In areas where there is little water development, government and other actors (e.g., private sector, NGOs and other development agencies) should be active in funding water development since there might be inadequate local revenue to fund such activities, and the functioning of decentralised institutions of water management.

There is need for information dissemination campaigns where the importance of regularising water users is undertaken.

8.3.4 Informal institutions

Interventions to strengthen the capacity of the informal systems in managing water resources should be formulated and implemented effectively. This is because the formal institutions draw heavily from the informal institutions if they are to effectively work. Some local arrangements such as one-to-one conflict resolution mechanisms are more efficient, more cost-effective, longer-lasting and more widely accepted among local water users than most top-down state-driven institutions. When considering formal state-based institutions, water users should not think that they are a panacea to all water management challenges.

In this regard, local informal water institutions should not be discarded as primitive and obsolete tools. Local water management arrangements need to be given time to evolve, with limited interference from external agencies, as they seek to address emerging water management imperatives especially in an environment that has been overwhelmed by new users in the irrigation sector.

8.4 Areas for further study

This study only focused on the formal and informal institution-performance linkages that exist between the formal institutions (irrigation water law, water policy and water administration) and the informal irrigation water institutions, and their constituent variables. However, more research is needed where the intra-linkages within formal irrigation

institutions will be evaluated to assess the nature of the linkages existing between them e.g. the linkages between the irrigation water law and irrigation water policy or between the irrigation water law and irrigation water administration.

In addition, exogenous factors need to be included also in further studies as both the formal and informal institutions do not operate in a vacuum. The extent to which these exogenous factors affect the irrigation water institutions need to be evaluated also.

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APPENDIX 1: RESEARCH QUESTIONNAIRE

EFFECTIVNESS OF IRRIGATION WATER INSTITUTIONS IN ZIMBABWE

A NEW INSTITUTIONAL ECONOMICS (NIE) THEORY APPROACH

The objective of this study is to evaluate the effectiveness of irrigation water institutions (formal and informal) in irrigation water management and the nature of the existing linkages between these institutions.

The overall goal is to develop effective and sustained agricultural water management institutions in Zimbabwe, particularly after the launch of the "Fast-Track" Land Reform Programme of 2000.

I therefore request that you spare some of your time to respond to herein given questions to the best of your knowledge. The researcher undertakes to keep the information private and confidential.

Please, you are kindly requested to answer ALL the sections as given in the questionnaire

Your cooperation on the above is appreciated.

Thanking you in advance!!!

RESPONDENT DETAILS

1. Type of irrigation system (Please tick appropriately)

A1 irrigation scheme	
A2 irrigation scheme	
Communally / resettled scheme	

2. Age……years

3. Number of years in education

Primary	
Secondary	
Tertiary	

A. IRRIGATION WATER LAW

A1. Do you have irrigation water rights? (Please √ the appropriate box)

1	yes
0	otherwise

A2. If ***YES*** to the above, in what form *(Please tick the appropriate)*

0 = no water rights 1 = unclear/unauthorised/scattered rights

2 = common state property 3 = riparian system[25] 4 = correlative *(proportional)* sharing

5 = licenses/permits

A3. *If **NO*** to A2 above, what are the constraints for not accessing the irrigation water rights?

1.....

2.....

3.....

4.....

5.....

6.....

A4. Are you aware of the existence of the irrigation water law?

1 = yes 0 = otherwise

A5. *If yes*, are there any clauses that provide for solving conflicts?

1 = yes 0 = otherwise

A6. State some of these conflict solving provisions?

1.....

2.....

3.....

4.....

[25] *Riparian water rights system is an arrangement where water is allocated among those who possess land about its source.*

5.....

A7. In your own judgemental opinion, using a scale of *0 – 10*[26], do you think these provisions of solving conflicts are effective among irrigation water users?

A8. If no, what are the major challenges you encounter?

1.....

2.....

3.....

4.....

5.....

A9. On a scale of 0 – 10, do you think that the water law is relevant for irrigation water users under the current and future situation?

.....

A10. On a scale of 0 – 10, how does it relate well to with other laws that you may know that try to promote effective irrigation water management?

.....

A11. On a scale of 0 – 10; and in your own opinion, how do you rate the water law provisions for private sector[27] participation in the following:

.....

A12. How effective and relevant is the water law and related laws to the current situation and future situation, using a scale of 0 – 10?

.....

B. IRRIGATION WATER POLICY

[26] ***Zero meaning the worst situation and ten meaning an ideal situation. The intermediate values are interpreted as the extent the actual situation deviates from either the worst or the ideal situation.***

[27] ***Private sector may include organizations like the private companies, NGOs, community participation, etc***

B1. In your own opinion and based on your experience as a farmer, do you think the project selection criterion is economic oriented?

1 = yes 0 = otherwise

B2. Do you pay for use of irrigation water?

1 = yes 2 = otherwise

B3. In what form do you pay for irrigation water? (Tick the appropriate)

1 = full subsidy 2 = partial recovery 3 = full-cost recovery

B4. On a scale of 0 – 10, do you think the government policies are favourable for promoting private sector participation in irrigation water management?

.....

B5. In your own opinion, how extensive is private sector participation in irrigation water management? *(on a scale of 0 – 10)*

.....

B6. Are you organised into Water Users' Associations?

1 = yes 0 = otherwise

B7. On a scale of 0 – 10, how extensive is WUAs' participation in irrigation water management?

……

B8. Are the government policies favourable for users' participation in irrigation water management *(on a 0 – 10 scale)*

.....

B9. Do you think other policies like fiscal policies, economic policies, etc., affect irrigation water management policy in managing water resources? *(Use a scale of 0 – 10)*

.....

B10. As a farmer, using your perception judgement *on a scale of 0 – 10,* do you think the water law links well with the water policy?

.....

C. IRRIGATION WATER ADMINISTRATION

C1. How is the administration of irrigation water organised?

1 = basin 2 = catchment 3 = sub-catchment 4 = other *(specify)*

C2. In your own opinion, how strong is the capacity of the administration in irrigation water management at your irrigation scheme *(use a scale of 0 – 10)*

.....

C3. If private participation was allowed, would you think it would reduce the burden on irrigation water administration and management? *(use a scale of 0 – 10)*

C4. If yes, in what ways?

.....

.....

C5. In your own judgemental perception on a 0 – 10 scale, how effective are user groups or WUAs in administration of irrigation water?

.....

C6. Do you have mechanisms of collecting updates and do maintenance of irrigation water at scheme level?

1 = yes 0 = otherwise

C7. If the answer is 1 to the above, what are some of these mechanisms?

.....

.....

.....

C8. Based on your judgement on a scale of 0 – 10, how adequate, relevant and reliable are water data in irrigation water management

.....

C9. On a scale of 0 – 10, do you think you have the capacity to effectively administer irrigation water through the water law and water policy

.....

D. INFORMAL WATER MANAGEMENT INSTITUTIONS

D1. What is the level of organisation at your irrigation scheme?

1 = A1 group 2 = A2 group 3 = communal/resettled 4 = other (specify)

D2. Are there clearly defined boundaries to withdraw irrigation water from Common Pool Resources (CPRs)

1 = existing 0 = otherwise

D3. Are there existing appropriation rules related to the local conditions with regards to irrigation water management?

1 = existing 0 = otherwise

D4. Identify some of these rules

……..I.....

.....

…….....

D5. Do you have mechanisms, e.g. constitutions to assist in irrigation water management at scheme level?

1 = yes 0 = otherwise

D6. How effective is the constitution in the management of water resources, on a scale of 0 – 10

……

D7. What are the responsibilities of the committee as determined by the constitution?

Post	Duties
e.g. Chairman	

D8. What mechanisms are there to ensure that responsibilities are effectively accomplished?

.....

.....

D9. Using your judgement, on a scale of 0 – 10, how effective are monitoring, conditions and the behaviour of the appropriators?

.....

D10. Is there an existence of regulation sanctions in irrigation water management for users who fail to act accordingly?

1 = existing 0 = otherwise

D11. Is there an existence of rapid access to conflict solving in the low-cost, local setting with regards to irrigation water management?

1 = existing 0 = otherwise

D12. Are there any users who challenge the rights of appropriators to create their own local-based institutions suited to their own local set-up?

1 = yes 0 = otherwise

D13. On a scale of 0 – 10, to what extent do these people challenge the rights of appropriators to create their own institutions based on their diverse local set-ups?

.....

D14. What are some of the ways in which these people challenge creation of local institutions?

.....

.....

D15. On *a scale of 0 – 10,* how effective are informal institutions / set of rules on the water law, policy and administration?

.....