4. TOWARDS SUSTAINABLE WATER RESOURCES AND IRRIGATION DEVELOPMENT IN THE POST FAST TRACK LAND REFORM ERA IN ZIMBABWE*

4.1 Introduction

The objective of this chapter is to discuss the role water resources and irrigation development can play in improving agricultural production in Zimbabwe. The general water scarcity in Zimbabwe is the most limiting factor to agricultural production. Recent structural changes regarding access to land and water, key factors in agricultural production, because of the Fast Track (FTLRP), further justify the focus of the chapter.

It is important to note that Zimbabwe has taken steps to address the water challenges. The major highlights include the water reforms that began in the mid 1990's which culminated in the promulgation of the Water Act and the Zimbabwe Water Authority Act which provide for sustainable water resource management. The country has also put in place a policy framework "Towards Integrated Water Resource Management" which aims to strike a balance between land, water and environmental aspects with human development needs.

There are, however, a number of challenges that still remain.

Major challenges facing water resources management include the following:

- 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

1

[1] Original research and draft for this Chapter by Dr Emmanuel Manzungu

- 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 that face irrigation development need to be addressed as well, as it is the largest water consumer in the country, using about 80% of the developed water resources, with the balance being used by urban, industry and mining (UIM). The challenges, 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;

- Putting in place a comprehensive policy and legal framework, which is lacking at the moment, to, among other things, promote integrated rainwater management encompassing both irrigation and rainwater harvesting (Rockstom et. al, 2002), given that 80% of total crop production is from rain-fed agriculture.

These issues will be further explored in the concluding section of this chapter.

4.2 Water Resources Development and Management: Issues and Challenges

This section undertakes three main tasks. First, it presents an inventory of water resources in the country, focusing on

developed resources as well as those under development. Second, it describes the main policy and legal framework that governs water management. Third, the challenges and issues that should be addressed in order to achieve sustainable water resource management are outlined.

4.2.1 Inventory of water resources

It is estimated that just over 70% of the country's water resources are committed (Annex 1) with actual utilisation estimated at 60 to 65 %. Of the total committed water, flow permits account for 16%, illustrating that inexpensive water is generally no longer available. Groundwater is generally not considered to be significant for irrigation development.

It is estimated that 45% of stored water is in government owned dams. The rest is in some 5 700 dams found in the former large-scale commercial sector and on privately owned plantation estates.

There is considerable unutilised water in government dams. The Department of Irrigation (2003) estimates that there is water in 23 government dams that could irrigate up to 15 600 hectares (Annex 2). This has been, and continues to be, a cause of concern to policy makers. This emphasises the importance of sound planning in the development of water projects, as part of a national water master plan.

There are also a number of projects that are under development (Annex 3). The major ones include Kunzwi, Gwaayi/Shangani (part of the Zambezi Water Project), Tokwe Mukosi and Marovanyati. The first two are predominantly for domestic water supply to Harare and Bulawayo respectively, while the last two are for irrigation development.

4.2.2 Main policy elements

4.2.2.1 Principles of water resource management

There are a number of principles that guide water resources management in the country. First, except for primary purposes (mainly for domestic uses such

as drinking, cooking and washing), any commercial use of water requires a water permit since the state owns all surface and underground water. Second, water is now managed by catchment areas, i.e. on a hydrological basis, as rivers do not match administrative boundaries. To this end, the country has been divided into Catchment Councils (CCs), which are further subdivided into subcatchment councils (SCCs) . Third, people with an interest in the use of water (stakeholders) have an opportunity to participate in making decisions at all levels about its use and management. All stakeholders are represented in CCs and SCCs, on the ZINWA Board and can be part of the panel of assessors at the Administrative Court. Further to this, the environment is considered a legitimate 'user' of water and competes with other uses, such as industrial, agricultural, mining and domestic. To this end, environmental water requirements should be provided for in catchment outline plans. Penalties against pollution, to maintain water quality, have been made more of a deterrent than previously, in accordance with the 'polluter pays' principle. Finally, water is now regarded as an economic good and not a free good. People who use water commercially are required to pay for it in accordance with the 'user pays' principle, so as to recover costs incurred in administering and managing water. However, the Water Act provides for the Government to ensure that water prices are socially acceptable.

4.2.2.2 Water Charges

Water charges that are liable to be paid by commercial water users relate to:

- A water levy meant to finance statutory aspects of water management.

This is paid by every permit holder allowed to abstract water from a river of bore hole or to share water. It is currently fixed at Z$40/ml an is being reviewed to Z$150/ml. It is collected by ZINWA.

- Agreement water charged to users of raw water from state dams: This is meant to recoup state's investment in the dams as costs associated with management and maintenance of facilities. As of July 2003 it rose to Z$740 from Z$270.

- Rates and fees collected by sub-catchment Councils from every commercial water user: This is meant for administering and managing water.

All water charges are approved by the Minister of Rural Resources and Water Development.

It is also important to note that dam construction projects implemented by ZINWA are 100% funded under the Public Sector Investment Programme (PSIP). The money that is collected by ZINWA from the sale of agreement water from these dams forms part of its revenue. There is no specific legal provision for the money to be reinvested in water development. The water levies that are collected from water users form part of the Water Fund. Other sources of the Fund include appropriations from treasury, donations and proceeds from investments. The Fund is administered by ZINWA on behalf of, and in accordance with directions from, the Minister. Purposes for which the Fund can be used include carrying out of ZINWA's statutory functions, reimbursing ZINWA for administration of the Fund and any other purposes that the Minister may consider are in the interest of water resources development.

4.3 Characteristics of the irrigable area

4.3.1 Extent and distribution

The estimated irrigable area in Zimbabwe is 550 000 hectares, of which 200 000 hectares has been developed. This includes functional and non-functional irrigation systems, as well as informal irrigation schemes. On the basis of physical criteria, only some extra 200 000 to 250 000 hectares can be irrigated (FAO, 1990).

Currently 120 000 hectares is functional. However, is has undergone significant structural changes, because of the Fast Track land reform, in relation to the composition, size and geographical distribution of the sub-sector (annexes 4 and 5). The size of the irrigated area in the communal and resettlement areas has changed marginally as has the area irrigated by the Agricultural and Rural Development Authority (ARDA). New entrants in the sub-sector include A1, A2 and indigenous large-scale commercial farmers, who between them now account for about 30% of the irrigated area. The number of out-grower farmers, who have a variety of relationships with the state-related or private estates that are attached to, is not known.

Plot size is another important parameter that determines agricultural productivity. A plot that is either too big or too small offers constraints in agricultural production. In the pre-FTLRP era, the average irrigated area in the large-scale commercial sub-sector was approximately 100 hectares while in the small holder sector, it ranged from 0.1 to 2 hectares. It has been observed that about 30% of farmers in the small holder irrigation schemes lack the ability to fully utilise their irrigated plots. It will be interesting to see whether the new irrigated plots are fully utilised in future.

4.3.2 Technology

Most of the irrigated area (over 80%) is under overhead (sprinkler) irrigation, with the remainder under surface irrigation. These two systems have efficiencies of 60 to 65% and 25 to 30% respectively. It is generally accepted that Zimbabwe's water use efficiencies are low. Attempts have been made to rectify the situation. Large-scale commercial farmers had started to invest in water use enhancing technology. For example, an estimated 250 to 300 centre pivots were brought into the country before the Fast Track programme. There was also some investment in drip systems.

Even in the small holder irrigation sector, some attempts have been made to improve water use efficiency. Beginning in the later 1980's, there was an attempt to introduce overhead irrigation, representing an improvement from surface irrigation. Some drip systems have also been installed in the small holder sub-sector by the Food and Agriculture Organisation (FAO) in conjunction with the Department of Agriculture, Research and Extension (AREX). Some Non Governmental Organisations (NGOs) are also distributing low cost drip systems. What remains to be established is the performance of the systems and their likely adoption by farmers.

4.3.3 Crops

Close to half of the irrigated areas is under a variety of perennial crops (Annex 5). In the LSCF sub-sector, the main irrigated crops grown include wheat and sugarcane, followed by tobacco, cotton, tea, coffee and horticultural crops like baby corn, asparagus and peas for export, among other crops. 'Normal' irrigated hectarage under annual crops include wheat (60 000) to 65 000 hectares), tobacco (20 000 to 35 000 hectares) and cotton, soya beans and maize (20 000 to 35 000 ha).

A wide variety of crops is grown in small holder irrigation schemes, including maize, cotton, wheat, tomatoes, leaf vegetables and other horticultural crops for home consumption and marketing. The problem in this sub-sector is low yields.

4.3.4 Irrigation rehabilitation

Table 4-1 shows that close to 50 000 hectares needed to be rehabilitated because of problems arising from the FTLRP. Through the Irrigation Support Fund, the Government has provided finance to undertake rehabilitation, mainly in the former large-scale commercial sector. ARDA administered the Fund for

which an interest rate of 20% was charged. There have been suggestions to reduce this to 10% but this appears unsustainable in the current high inflation environment.

It is impossible to deduce the average size of the irrigated plot or the cost of rehabilitation per hectare because of the unavailability of data. However, Z$10.8 billion having been used to rehabilitate 45 000 hectares means that the cost of rehabilitation per hectare was Z$240 000. Since it is government policy for the A2 model to be based on cost recovery, it is important for the fund to be converted into a revolving fund. Also, the pledge by the Government to compensate former owners for improvements on the farm makes it important for the people that benefited to pay back the money.

Table 4.1: Extent and cost of rehabilitating damaged irrigated area

Province	Extent of rehabilitation			COST OF REHABILITATION (Z$) IN 2003		
	Minor area (ha)	Major area (ha)	Total area (ha)	Money disbursed (Z$m)	No of Beneficiaries	Per capita Disbursement (Z$m)
Mashonaland Central	2 680	3 820	6 500	2.167	168	12.9
Mashonaland East	4 610	200	4 810	2.938	239	12.3
Mashonaland West	13 440	9 480	22 920	2.890	189	15.3
Manicaland	6 580	640	7 220	632	65	9.7
Matabeleland North	170	350	520	156	29	5.5
Matabeleland South	230	890	11 110	175	23	7.6
Masvingo	50	1 450	1 500	213	43	4.9
Midlands	4 300	490	4 750	409	41	10.0
TOTAL	32 060	17 320	49 380	10.083	797	78.2

Source: Extrapolated from data provided by the Department of Agricultural Engineering (2002) and ARDA.

4.4 Legal and policy framework

Legal issues in irrigation development touch on land, water, and the irrigation infrastructure. In the former LSCF areas this was not problematic because the farmers had title to their

land, had water rights and bought their own irrigation infrastructure. This was not the case in irrigation schemes found in communal and resettlement areas, where there was a lack of legal clarity in relation to farmers' 'rights *vis-à-vis* these three factors. Irrigated areas acquired under the Fast Track have been affected by the same lack of clarity.

Some of the policy objectives and strategies that need to be considered include:

- Establishing a water pricing structure consistent with cost and social efficiency;
- Establishing an effective institutional structure;
- Implementing efficient drought mitigating strategies;
- Promotion of farmer managed and operated systems;
- Better co-ordination in implementation between public-public and public-private/NGO sector bodies; and
- Formation of effective, farmer-defined water users' associations,

The development of the policy and legal framework is now urgent, given the numerous concerns in the irrigation sector today.

4.5 Institutional framework

A number of government institutions are involved in irrigation development (Table 4-2). Government's efforts are complemented by the private sector, which manufactures and supplies various irrigation components. Zimbabwe is one of the few African countries where there is a local irrigation manufacturing capacity. There is enough manufacturing capacity to meet local demand in relation to piping (both aluminium and plastic) and pumps (one manufacturer can produce 70 types). The Irrigation Institute of Zimbabwe (IRRZ), representing the major players in the industry, promotes irrigation development in the country by advocating acceptable standards (through a certification process) and dissemination of information.

Table 4.2: State institutions in irrigation development

INSTITUTION	FUNCTIONS
Department of Irrigation (DI)	Responsible for irrigation development in the small holder irrigation sector. Also responsible for policy formulation
Department of Agricultural Engineering (DAE)	Field water management, operation of infrastructure and irrigation research
Department of Agricultural Research and Extension (AREX)	Undertakes soils surveys as well as providing extensions to farmers
District Development Fund (DDF)	Irrigation development for small holder irrigation schemes of up to 20 hectares for rural communities
Agricultural and Rural Development Authority (ARDA)	Irrigation development for large scale, state funded irrigation schemes. Also operates its own irrigation schemes and administers settler schemes that are attached to it
Rural Development Fund (RDF)	Develops small holder irrigation schemes, usually 5 hectares or less
Zimbabwe National Water Authority (ZINWA)	Participates through construction of dams, pipelines, and water treatment works, canals and irrigation systems

4.6 Issues and challenges for sustainable irrigation development

4.6.1 Policy, legal and institutional deficiencies

Policy deficiencies in irrigation have resulted in a lack of clear direction for irrigation interventions. Examples include lack of secure land tenure arrangements, which has the effect of hampering long term investment in irrigation by the farmers. Evolving institutional arrangements in the public irrigation sub-sector are hindered by 'turf wars' and duplication of effort between various government departments.

4.6.2 Subdivision of on-going concerns

Challenges facing irrigation development as a result of the Fast Track mainly relate to the sub-division of

on-going concerns. Plot allocation did not take account of the fact that the irrigation systems were meant for a single user and were, therefore, not amenable to being used by multiple users without either physically changing the system or devising new rules of operation. There are reports of lack of co-operation in relation to sharing the water and irrigation infrastructure, and settling water and electricity bills. Some irrigators are denied servitude to convey water across other people's fields. This has been compounded by lack of experience in utilising and managing water, which is low at both the field and catchment level, resulting in low crop yields and poor water resource management. Yet another problem is that the allocated plots, as in Middle Sabi, are too small for viable crop production, at least in relation to growing field crops such as wheat and cotton.

Scale problems have also arisen. The new smaller farm sizes require smaller pumps, transformers, tractors and other equipment, which are not readily available on the market.

4.6.3 Out-grower irrigation schemes

Out-grower schemes attached to ARDA estates have always had problems relating to the fact that they were designed for a block of farmers and not for individuals. This system, which used to be workable when farms were growing the same crops as ARDA, is no longer satisfactory in a deregulated environment where farmers grow different crops. There have also been problems relating to the rights and responsibilities of the out-growers. A further problem has been a perceived cheating on the part of the core estate, regarding grading of produce for crops like tea. These problems have also been reported on privately owned core estates.

In the aftermath of FTLRP, one other problem has emerged. There is a view that all the land of the core

estate should be given to settlers leaving the private sector to processing produce. This seems to be the view that led to the demarcation of Mkwasine Estate. An opposing view is that the private estates represent a concentrated source of expertise without which the settlers would find it difficult to operate.

4.6.4 The irrigation industry

The irrigation industry is facing a number of problems, namely:

- **Operational problems –** relating to power cuts, lack of credit finance and sizing equipment for new farmers.

- **Lack of quality standards –** for both domestic and international markets.

- **Lack of foreign currency –** against a background of 50% import content for raw materials.

- **Unfair duty structure –** that penalises local manufacturing/assembly or irrigation components.

4.6.5 Compromised financial sustainability

The administration of the Irrigation Support Fund demonstrated the need for putting in place measures that ensure financial sustainability in the public irrigation sector. These need to be complemented by the private, NGOs and donor sectors, based on clear policy direction.

4.6.6 Poor agricultural water productivity

The generally acknowledged poor level of agricultural water productivity points to the need to seriously explore relevant issues. These relate to complementarity between irrigated and rain-fed arable production to make efficient use of the available land and water resources, promotion of water saving technology, and strengthening of the local irrigation industry with a view to making irrigation components more efficient and affordable.

4.6.7 Research and Training

Since the 1980's , the FAO, in conjunction with Agritex and later AREX, has offered on the job training for irrigation engineers. It started as an in-house intensive training course. The course has since been upgraded to a regional one and the organisers are actively seeking accreditation from the University of Zimbabwe. It uses facilities at the Zimbabwe Irrigation Technology Centre (ZITC) at the Institute of Agricultural Engineering in Hatcliffe, Harare. Zimbabwe could benefit from hosting this regional course. While it does so to some extent already by hiring out the ZITC facilities, the lack of standard accommodation reduces the benefits that can accrue.

There is a need for training of junior staff because trained personnel have left the public service for a variety of reasons. Training of new staff is, however, constrained by the lack of adequate funds.

The situation is different in the private sector in that it is the technician grade that is required. There has also been a flight of skills from the country at this level. For example, IRRZ reckons that some 200 designers have left the country. Replacing these is difficult because of the high cost of training. The other problem is that the courses offered by various colleges contain very little on irrigation. This is made more difficult by the fact that irrigation encompasses many disciplines.

The Zimbabwe Manpower Development Fund (ZIMDEF) is not helping as virtually no money is given to industry for training, despite the fact that industry contributes to the fund.

4.6.8 Energy problems

Generally, irrigation development in Zimbabwe is hampered by high-energy costs. Efforts should be made to find a way of keeping the charges within reasonable limits or searching for cheaper alternatives.

4.7 Conclusions and Recommendations

In Zimbabwe water is a limiting factor in agricultural production because of its general scarcity. It is, therefore, critical that it be used wisely for the socio-economic development of the nation through increased agricultural production. The FTLRP, despite its limitations, offers an opportunity to restructure simultaneously two key factors in agricultural production, namely land and water.

Efficient water management comes from managing water as a component of a system made up of land, water, ecosystems and human activities that should be integrated. This concept, called 'integrated water resource management' (IWRM), has been adopted as the strategy for water resource management in Zimbabwe on order to achieve sustainable water resource management (SWRM), in which the rate of water utilisation does not exceed its replenishment. Irrigation development, in which the management of human, water, financial and infrastructure resources plays a central role, is an important component of SWRM since irrigation is the largest water user in the country.

This section addresses some of the issues that were identified as posing challenges to water resource and irrigation development. Before going into the specific recommendations, there is a discussion of what are regarded as crosscutting issues for both water resource and irrigation development.

4.7.1 Cross-cutting issues

4.7.1.1 The need for a national water master plan

This study has highlighted a number of weaknesses regarding water resource and irrigation development in Zimbabwe that need to be addressed if sustainable water resource is to be achieved. These include under-utilisation of developed water resources, the low status accorded to statutory/non-commercial aspects (catchment management, water quality monitoring and research), a lack of mobilisation of non-state funds for water development, unauthorised

water use and lack of strong local participation, among other things. These issues are best addressed within the framework of a national water master plan, which would have the added advantage of redressing loss of institutional memory due to staff turnover.

A water resource management strategy, as the one that exists today, has the advantage of being flexible. It, however, tends to be too broad and to lack enough detail to operationalise water resource management. This explains why catchment councils are supposed to produce catchment outline plans. However, the expectation that a national water master plan is an aggregate of catchment outline plans produced by the various catchment councils is misplaced. The lack of capacity among the majority of stakeholders makes production of a good catchment outline plan unlikely. This is borne out by the quality of the preliminary catchment outline plans, which, in the words of Swatuk (2002), concentrates on supply side issues and are comprised mostly of 'platitudes and wish-list objectives'. Given the dynamics of the situation it would be better if the state, through ZINWA and the Department of Water Development (DWD) and in conjunction with CCs, took the initiative of producing catchment outline plans, not as a new and separate process but as an enhanced process during this transition.

A national water master plan has also to engage with irrigation development since irrigation is the largest water user. This requires assessment of physical, human, financial, material and technical resources and how they will be mobilised.

Some of the elements of the proposed national water master plan which are elaborated in the subsequent sections include:

- Assessment of water resources, including surface and groundwater, developed and undeveloped,
- Irrigation (blue water) and rainwater harvesting (greenwater);

An assessment of the water demand of the various sectors (primary, urban, industry and mining, irrigation, environment) taking into account demographic and socio-economic issues in the short, medium and long term;

- Prioritisation of different water uses, between and within sectors, according to objective criteria;

- Identification of technology and institutional support for enhancing agricultural water productivity;

- Establishing environmental requirements;

- Ensuring financial sustainability, including the foreign currency component.

It should also be added that there already exists part of a national water master plan in the form of the National Master Plan for Rural Water Supply and Sanitation (Interconsult/Norad, 1985). This is a comprehensive document that has been used to great effect and perhaps explains why Zimbabwe has made great strides in this area.

4.7.1.2 Funding of research

Research into various aspects of water resource management is critical for sustainable water resource management. The research budget of public institutions is negligible. To improve the situation, it is proposed that a Water Research Fund be established. This could be financed by dedicating a certain percentage (say 1%) of sales of raw water to this Fund, along similar lines to this Fund, along similar lines to the Rural Electrification Programme that is administered by the Zimbabwe Electricity Supply Authority. A competent Board, drawing its membership from the academic community, private sector and civil society, should run this Fund. The Fund should have laid down procedures, such as who is eligible for funding and what areas can be funded on a competitive basis. The Research and Data Section of ZINWA should co-ordinate this Fund.

To improve irrigation research, the Zimbabwe Irrigation Technology Centre (ZITC) should be revived as a testing centre for irrigation equipment. If this is done as part of the certification programme, the chances of success may be enhanced.

4.8 Water resource development and management

The legal, policy and institutional framework in place is generally adequate for sustainable water resource management. The problem lies in the operational realm. The water reforms that were legislated for in 1998/99 are still to take shape in terms of establishing the relevant institutions and operational mechanisms, such as creating a functional water permit system and collection of the various water charges. The Fast Track has provided more development challenges to the Institutions, which are still in their infancy. Some of the institutions mandated to oversee water resource development have found it difficult to cope. The required interventions needed to bring about improved water resource management appear below.

4.8.1 Assessment of water resources

The country has limited water resources, which should be carefully assessed. The assessment should include all the sectoral requirements in the short, medium and long term. The current level of water utilisation should also be assessed. Such information could be used for developing catchment outline plans. Collection of information should involve local water users, ZINWA, and catchment and subcatchment councils. With regard to agriculture, the assessment should include both blue and green water as a basis for promoting complementarity between irrigated and rain-fed farming.

4.8.2 Regularising water use

In order to regularise water use, a mixture of carrot and stick measures is required. The main measures are described below.

- **Towards water permits:** Essentially, regularising water use means that water users take measures to obtain a water permit or agreement for use where this applies. To this end, a directive should be issued to the effect that all users of water should, by a certain date, start applying for water permits. Advertisements placed in the media could be used to indicate that by a given date, everyone should at least have indicated that they are using water.

- **State to assume ownership of dams in newly resettled areas:** The Ministry of Rural Resources and Water Development, as the custodian of the country's water resources, should, through ZINWA, be mandated to become the owner or all dams in the newly resettled areas. Farmers should then enter into negotiations with ZINWA about using the water.

The proposed take-over can also be justified on the grounds that dams belong to the Government, since it has given an undertaking to compensate displaced farmers for improvements on the acquired farms, including dams.

- **Information dissemination:** There is a need to undertake information dissemination campaigns on the importance of regularising water use, as well as the role of catchment and subcatchment councils. This is an exercise best co-ordinated by the Department of Water Development . There is a need to have in place a defined budget from the Water Fund for this exercise.

- **Strengthening local water management:** Stakeholder participation in water resource management needs to be strengthened by creating a third tier that will ensure that there is more participation by local people. This has already happened in Mazowe and Sanyati catchments.

- **Co-opting new settlers in water management structures:** To ensure the co-operation of the new

settlers, they must be made part and parcel of the water management process. Since the situation is evolving, the best approach is to set interim catchment and sub-catchment councils and hold elections when the situation stabilises. As part of their duties; the interim committees should be mandated to conduct elections. The Minister can issue such a directive under the current regulations.

4.8.3 Prioritisation of water development

Prioritisation of water projects is key for sustainable water resource development. This mostly applies to dam construction. There is a need to prioritise on-going projects so that they are completed before new projects are embarked upon. The under-utilisation of water in some dams, while other dams are being constructed suggests a lack of prioritisation and pre-occupation with dam construction. Measures such as limiting demand for water, leak, detection, water recycling, and reducing wastage of water, can lessen the urgency for the building of expensive structures.

4.8.4 Water pricing

Water pricing can be used as a tool to control water use. However, the right balance between economic and social objectives is critical. Some proposals appear below.

- **Economic water charges:** As far as possible, economic water charges should be collected from water users in line with the user pays principle. A poor water pricing structure often ends up subsidising the rich and punishing the poor.

- **Balancing commercial and developmental needs:** There is concern about the fairness of the charges that ZINWA levies farmers. There is a need to ensure that water charges do not push farmers out of business. The Department of Water Development should undertake an exercise on

rationalising water charges so as to come up with a system that balances the commercial needs of ZINWA and the general developmental needs of the nation at large.

- **Targeted subsidies:** The various water charges that apply should be rationalised and revised. For example, the insistence by some catchment councils on levying every herd of cattle violates the Water Act, which allows livestock watering as primary water use. It is, therefore, recommended that the authority that has been given to some catchment councils to levy every herd of cattle be withdrawn, as this is illegal. Such subcatchment councils should be allocated some money from the Water Fund. Water charges in the rural areas should be reduced, as provided for in the law.

4.8.5 Strengthening statutory/non-commercial aspects

The statutory or non-commercial aspect of water resource management are critical in that they ensure the sustainability of water research. Because of their long-term nature, they are not widely appreciated. It is important that these aspects, discussed below, be accorded their due importance.

- **Strengthening catchment management:** Catchment management has been compromised by lack of finance to undertake related activities and also because of being overshadowed by concerns of water supply. It is recommended that catchment management positions be created in both DWD and ZINWA. For DWD, one officer will suffice. For ZINWA, there is a need for a position in the Planning Section and also at catchment council level. There is also a need to co-ordinate with the Department of Natural Resources, which does similar work. Co-ordination would be better if the two were both under the Ministry of Environment and Tourism.

There is also a need for a forum of all catchment councils in Zimbabwe to share information as well as

to lobby on matters of common interest. The proposed Association of Catchment Councils of Zimbabwe should receive financial support from Government for its establishment. Catchment cuncils within the same river basin should form some co-ordinating body to discuss matters of common interest.

- **Water quality monitoring:** There is a need to make financial and human resources available so that the national water quality monitoring system can be completed. In the long term, it will be necessary to invest in a telemetric monitoring system.

- **Research:** There is a need for a defined budget from the Water Fund for research into various aspects of water resource management. The state funds should, however, be augmented by taking advantage of regional and international research funds. Examples include the Water Research Fund for Southern Africa (WARFSA) and the Centre for Environmental Economics and Policy in Africa (CEEPA).

4.8.6 Towards financial sustainability

Financial sustainability of water resource/irrigation projects at a project and national level is required. This should include developmental aspects. The means to achieve such sustainability are discussed below.

- **Private sector participation and other non-state actors:** Private sector participation in water resource development needs clarification in light of the new water legislation and the Fast Track. The Department of Water Development, in consultation with ZINWA, should produce a position paper in this regard. The construction of the Gwaayi Shangani Dam as part of the Zambezi Water Project under the Build, Operate and Transfer (BOT) model, involving the Matabeleland Water Trust, Bulawayo City and a private investor, should be the harbinger of similar initiatives.

- **Reconstituting the Water Fund:** The Water Fund is not explicit about its use in development-oriented projects. It is recommended that part of the Fund, say 5%, be reserved for water/irrigation projects. The money should be part of the Irrigation Fund (see below) for concessionary lending to farmers.

- **Reinvesting in water development:** As with the Water Fund, the money that is collected by ZINWA from the sale of agreement water should be used for water development. Such a move would make it possible for ZINWA to fund some dams from its own resources and not entirely from PSIP, as is the case now.

- **Targeted subsidies:** Targeted subsidies that go to the intended beneficiaries can assist in maintaining financial sustainability because of reduced wastage. DWD needs to come up with a policy position on the issue of targeted subsidies.

4.9 Irrigation development and management

Irrigation development requires that several measures be co-ordinated. This section outlines a number of them. Overarching all these issues is the legal and policy framework that enhances or compromises the various efforts to make irrigation succeed.

4.9.1 Institutional rationalisation

The recent restructuring exercise that was undertaken in the irrigation sub-sector has resulted in more fragmentation of efforts. Some rationalisation of the institutions is needed. To streamline the irrigation sub-sector, it is recommended that the irrigation functions in DDF, ARDA, Department of Agricultural Engineering, Department of Irrigation, AREX and ZINWA be brought under one department. Such a department should be able to develop small, medium and large-scale irrigation schemes. It could also plan, design and construct schemes, operate and maintain

them, and undertake consultancy services. Such a set up not only avoids duplication of administrative structures and equipment, but should also be able to exploit economies of scale. The natural home for such combined irrigation activities is the Department of Irrigation. Therefore, this Department must be expanded accordingly. The housing of the Department of Irrigation in a non-agricultural ministry is a cause for concern. Such a system reduces irrigation development to engineering exercises. The Department of Irrigation should, therefore, be transferred to the Ministry of Lands, Agriculture and Rural Resettlement.

4.9.2 Improving agriculture water productivity

It is important that water is used productively, that is, more produce should be obtained from each unit of water. Below is a description of some of the measures that can be used to realise increased agricultural water productivity.

- **Increasing water use efficiency through technology:** Efficient use of water, such as through technology that are water saving, is critical for improved agricultural productivity. For example, drip systems can result in efficiencies of 80% and above, and overhead irrigation can achieve up to 60% efficiency compared to conventional surface systems that can have efficiencies as low as 30%. The challenge is to ensure that these water saving technology are widely used. Incentives should be put in place to cause the switch. In this regard, farmers should be encouraged to make the change by offering tax breaks e.g. by reducing or scrapping sales tax or customs duty on such items.

- **Rainwater harvesting:** Improving water use efficiency should not be confined to (blue) irrigation water but should also be extended to rain-fed agriculture. To this extent, there must be concerted efforts to promote water harvesting in the form of

research/extension into appropriate field technology in relation to the hardware as well as agronomic requirements. An important component is to strive to combine both forms where possible e.g. through supplementary irrigation.

Money in the form of cheap loans should be available to farmers engaged in water harvesting, just as it was for irrigation under the Irrigation Support Fund. Rainwater harvesting can enhance crop production at a fraction of the money that would be needed for irrigation. Such measures promote food security since food crops tend to be grown under such systems.

- **Optimising irrigation water:** Supplementary and deficit irrigation, as well as precision irrigation should be encouraged.

4.9.3 Towards financial sustainability

Below is a description of measures that can be taken to achieve financial sustainability in the irrigation subsector:

- ***Audit and re-warehousing of the Irrigation Support Fund:*** The money that the Government makes available for irrigation development needs to be well managed as part of ensuring financial sustainability. In this regard, the Irrigation Support Fund that was meant for rehabilitation was a disappointment. Money was disbursed without credible operational mechanisms, for example, mechanisms relating to how the money was to be recovered. The Z$10 billion fund should be audited before the loan portfolio is transferred to the Land Bank, which, as a financial institution, has sufficient financial control mechanisms.

- ***Setting up a revolving Irrigation Fund:*** A dedicated revolving fund, along the lines of the National Irrigation Fund of the 1980s, should be put in place. The Fund should be meant for irrigation

infrastructure and not for crop inputs, which should be financed separately. Such a Fund should have very clear guidelines on the borrowing conditions.

A proportion of the Fund should be earmarked for food security projects where poor people could borrow to install low cost irrigation systems. Such an instrument, with a low capital threshold and low interest rates, could be an empowerment tool to help the disadvantaged people who normally lose out on big projects. Women could benefit from such an intervention. The Land Bank and other financial institutions should administer the Fund.

- ***Mobilising private and NGO sector finance:*** There is a need to involve other players other than the Government in financing irrigation development. Efforts must be made to look at how the private and NGO sectors could make a contribution. For example, NGOs could be persuaded to contribute to the fund meant for poor people. A policy pronouncement would need to be made, hence the importance of an irrigation policy supported by an irrigation Act. Bilateral and multilateral sources should also be sought.

- ***Funding informal and unconventional irrigation:*** Informal irrigation, estimated at 20 000 hectares, has been found to achieve higher yields and to be more financially sustainable that the formal schemes. Despite this, it has not received acknowledgement or any material support from the state. The availability of loans to finance low cost technology in such irrigated areas would go a long way to improve production in these schemes. In the same breath, low cost irrigation systems e.g. low cost drip systems and treadmill pumps, should also be promoted. This should be financed through cheap loans.

- ***Cost-benefit analysis of irrigation projects:*** Irrigation development needs to proceed on the

basis of a comprehensive cost-benefit analysis. While this has been done in the past, it was not through. A way forward is to abandon the system where repayment of loans borrowed to finance some schemes comes from the general fiscus. In this respect, the Chinese system should be adopted. Every farmer in an irrigation scheme, which was funded by a loan, makes an annual contribution until the loan is retired (Diemer, personal communication).

- ***Targeted subsidies:*** Just as for water development, there is a need for targeted subsidies . The Department of Irrigation should come up with a policy position on this.

4.9.4 Out-grower irrigation schemes

One problem has been to view out-growers as a homogenous group of farmers pursuing one common agenda. The next generation out-grower schemes should be flexible enough to allow different production systems and targets. As far as possible, irrigation designs should allow for individual irrigation.

The legal framework has been weak in many cases, for example, the rights of settlers regarding the land and the infrastructure. Government's reluctance to give title to land has resulted in a situation where non-performing farmers cannot be evicted. This has been worsened by the insistence that no renting out of plots is allowed, even though it happens in practice.

To correct the situation, there should be mechanisms where plots can change hands legally. The current system precludes renewal of the scheme through the infusion of new farmers. Out-growers should also be involved in the decision-making process around the issues that concern them.

4.9.5 Irrigation management on subdivided on-going concerns

A number of options can be pursued regarding the management of irrigation on subdivided plots, which

were on-going concerns. First, it may be necessary to reallocate the plots, taking into account the layout of the irrigation facilities. Second, the schemes may be redesigned to make the plots self contained. Third, the beneficiaries may work together to make it a success. Either option has human, material and financial costs. The question of who bears the costs needs to be answered.

In some cases, the better option is just to redesign the consolidation of plots, which can also be divided by relocating some settlers. In such a scenario, the solution is purely physical where the farmers become independent. In reality, however, a complete separation may not be possible. Therefore, there is a need to craft viable institutional arrangements.

4.9.6 Strengthening the local irrigation industry

The irrigation industry needs to be strengthened in three ways as described below.

- **Foreign currency provision:** The industry needs foreign currency for the importation of raw materials. To satisfy the growing demand for irrigation facilities, some US$10 million is required annually.

- **Favourable duty structure:** The industry requires a lowering of the duties levied on irrigation components. It is, therefore, recommended that the tariff for an imported unit should be the same or lower than the rate for the irrigation components. This will reduce the import bill for the manufacturers who, hopefully, will pass it to the consumers. Besides, local manufacture creates jobs.

- **Certification:** The Government must assist in ensuring that local manufactured goods undergo a certification process to ensure quality of production. There is a need for local certification to be gradual so as to incorporate the new entrants into the market place.

4.9.7 Prioritisation of irrigation development

Irrigation development has to somehow be phased, since not all things can be done at the same time. The current focus on irrigation should not loose sight of this important fact. Priority of irrigation development could be as follows:

1. The area needing rehabilitation, which amounts to 50 000 hectares;

2. New irrigation where an existing water source is available, which amounts to 16 000 hectares;

3. New irrigation where suitable soils and semi developed water resources are in close proximity, such as the Tokwe Mukosi project.

4. New irrigation where a cheap water source is available and can easily be developed.

5. New irrigated areas requiring substantial financial resources.

Besides these mega-projects, there is also a need to prioritise food security projects, In fact this is an exercise that also includes rain-fed farming. The assumption that all irrigation will be developed by the state is a disturbing feature. Prioritisation should also stipulate the extent to which the private sector will develop irrigation.

4.9.8 Training and Research

Training and research has several components as discussed below.

- ***Technician training:*** Consideration should be made to having in place a comprehensive irrigation-biased higher diploma, which has a series of stages that could also be used to gain entry to university if desired. In this regard, consultations between the Irrigation Institute of Zimbabwe, training institutions and public institutions in the irrigation sector are recommended. The Department of Irrigation should

conduct a training needs assessment for training irrigation personnel at the technical level.

- **Reconstituting Zimbabwe Manpower Development Fund:** ZIMDEF needs to be sensitive to industry's needs by allocating realistic amounts for on the job training.

- **On the job training for engineers:** The University of Zimbabwe is encouraged to accredit the FAO regional course on irrigation design, construction and management as soon as possible, subject to satisfaction of standing rules. This will facilitate on the job training of the junior staff that are currently the majority in the public sector. The accommodation facilities at ZITC should also be upgraded so that trainees can be housed there. This is a good investment, as trainees from outside Zimbabwe will bring in foreign currency.

- **Farmer training:** The Department of Irrigation should embark on assessment of skills and training requirements in irrigation in general. Recommendations must be made on the way forward. Training needs to be completed by research. Some of the topics that can be investigated include the role of supplementary and deficit irrigation, identification of appropriate technology for different categories of farmers such as poor, women, rich etc, and for different objectives e.g. to save water and reduce energy costs, and rainwater fed harvesting for enhanced agricultural production and food security.

4.9.9 Affordable energy for irrigation

The Department of Irrigation should commission a study on cheap energy options for irrigation, particularly for small holder irrigation schemes.

4.9.10 Need for an irrigation policy and irrigation Act

There are a number of areas where the policy and legal framework is not clear. This is hampering sound

irrigation development and management. Below is an overview of the areas of concern. In all cases, the Department of Irrigation should take the lead towards the legal and policy formulation.

- **Security of tenure:** Land tenure in the newly acquired farms is not yet clear, an issue which should be addressed as matter of urgency. This is because irrigation is both an expensive and a long term investment that requires security. To this extent, farmers should be accorded long leases of the property they are farming, with an option to buy. The current talk of farmers getting a 99 year lease with an option to buy is a step in the right direction. However, one important caveat needs to be made. A lease without the force of law to protect the conditions of the lease is invalid. This point cannot be emphasised enough.

- **Regularising use rights of state-owned infrastructure:** At the moment there is no clear policy position regarding the ownership and use status of irrigation facilities found on the resettled properties, such as dams, pumps, canals and pipes. The new settlers found these in varying states of operation and, in many cases, they used their own money or borrowed money to rehabilitate the infrastructure. Since the Government is still to compensate the previous owners it means that the new farmers repaired government property without any agreed conditions. The options available to regularise the situation are either to let the new farmers buy the infrastructure from the Government or lease it (the legality of this when in many cases the Government itself has not acquired the assets legally is a contentious point). In either case, the details will need to be worked out. The Department of Irrigation, together with ZINWA, should be mandated to begin the process by carrying out an inventory of such facilities. The improvements that have been made by the new farmers should also be noted and the price of the leasing fee adjusted accordingly. The state may also contract the private

sector to do the exercise. The same exercise could be used to determine the amount of compensation that will be paid to the previous owner.

There is a similar legal vacuum in relation to irrigation infrastructure in the communal and old resettlement areas. The same recommendations can be made for this situation. The above clarifications will not amount to much if there are no steps made to protect life and property on the farms.

- **The role of farmers:** It has been proven world-wide that farmer control of farming activities in irrigation schemes is a basis for better agricultural performances. Small holder irrigation in Zimbabwe has suffered from lack of farmer control. The newly resettled areas seem to suffer from the same problem.

In order to promote agricultural water productivity, farmers should be given, as far as possible, full operation and maintenance responsibilities for the schemes where they are farming and should pay the related costs of running the scheme. If any subsidies are to be made available, these should be well targeted. The best approach would be to subsidise the cost of water, as this would have a direct impact of the intended beneficiaries. Farmers should be active members of management committees of the irrigation schemes. In this regard, Irrigation management Committees should be given semi-legal status. Farmers can be organised as a Trust. They should also be part of catchment and subcatchment councils, so as to protect their interests, and should assume defined user rights to state infrastructure.

4.10 ANNEXES

Annex 4.1: Status of water resource development in Zimbabwe

CATCHMENT	M.A.R. Million ML	STORAGE RIGHTS Million ML	FLOW RIGHTS Million ML	TOTAL COMMITTED Million ML	% COMMITTED
Gwaai	1.33	0.17	0.07	0.24	18.3
Manyame	2.85	2.57	0.17	2.74	96.3
Mzingwane	1.16	1.15	0.07	1.21	104.7
Mazowe	4.44	1.19	0.26	1.46	32.9
Runde	2.40	4.50	0.28	4.78	106.0
Sanyati	3.22	2.12	1.06	3.18	98.6
Save	4.52	1.49	0.72	2.11	46.7
TOTAL	19.92	13.19	2.63	15.72	503.5
Average	2.84	1.89	0.37	2.25	71.9

Source: Department of Water Development (personal communication, July 2003)

Annex 4.2: List of state dams with unutilised water

PROVINCE	DISTRICT	SCHEME	AREA ha	COST ESTIMATE (Z$ Million)
Mashonaland Central	Bindura	Mufurudzi	35	95
Mashonaland Central	Shamva	Banana	50	129
Mashonaland East	Goromonzi	Dzvete	30	101
Mashonaland East	Marondera	Evergreen	30	103
Mashonaland East	Uzumba	Mutawatawa	20	51
Mashonaland West	Chegutu	Seke Sanyati	100	234
Mashonaland West	Kadoma	Makwavarara	300	600
Mashonaland West	Kariba	Negande	16	47
Matabeleland South	Gwanda	Mtshabezi	300	950
Matabeleland South	Matobo	Maribeha	234	933
Masvingo	Bikita	State conservancy	10 000	20 000
Masvingo	Chiredzi	Ngwane ranch	200	250
Masvingo	Chivi	Mbindangombe	150	442
Masvingo	Chivi	Nyahombe	178	665
Masvingo	Gutu	Matezwa	60	260
Masvingo	Mwenezi	Manyuchi	228	300
Masvingo	Zaka	Machena	100	440
Masvingo	Zaka	Mushaya-Bangala	54	240
Midlands	Mberengwa	Muchembere	22	65
Manicaland	Mutare	Osborne	2 000	4 000
Manicaland	Mutare	Marange 11	500	1 000
Manicaland	Mutare	Mukwada	100	2 000
TOTAL			15 607	32 905

Source: Department of Irrigation (2003)

Annex 4.3: Major water projects under development

PROVINCE	DISTRICT	SCHEME	AREA (HA)	COST ESTIMATES (Z$ MILLION)		
				Irrigation Develop-ment	Dam Construction top up	Total
Mashonaland East	Goromonzi	Kunzvi	1 000	2 000		2 000
Matabeleland North	Lupane	Gwayi/ Shangani	6 000	12 000	1 500	13 500
Masvingo	Mwenezi	Tokwe Mukosi	22 000	44 000	1 560	45 560
Midlands	Gokwe	Mutange	105	240	650	890
Manicaland	Buhera	Marovanyati	1 250	2 500	705	3 205
TOTALS			30 355	60 740	4 415	65 155

Annex 4.4: Distribution of irrigated area in the pre and post Fast Track era

Category	SIZE OF IRRIGATED AREA			
	BEFORE FAST TRACK		AFTER FAST TRACK	
	Area	% total area	Area (ha)	% total area
A1	-	-	7 620	6.3
A2	-	-	12 450	10.3
Communal and 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	3 600	-
Others	-	-	63 470	52.7
Informal	20 000	11	20 000	Na
Total	186 600	100	120 410	100

Source: IFAD (1997), DAE (2002, personal communication) and own computation

Annex 4.5: Distribution of formal irrigated area (ha) after Fast Track

PROVINCE	A1	A2	COMMUNAL & RESETTLED	INDIGENOUS LSCF	ORIGINAL 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	**25 890	43 900
Mashonaland Central	2 000	2 450	760	6 220	3 050	100	320	14 900
Matabeleland South	70	1 200	1 400	-	100	940	-	3 710
Matabeleland 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	63 470	120 410
% of total irrigated area	6.3	10.3	9.8	7.7	6.8	6.3	2.7	100

Source: Department of Agricultural Engineering (2002, personal communication)
*This figure is way below the commonly cited figure of 13 500 ha
**The basis of this figure is not known

Annex 4.6: Irrigated area under perennial crops

CROP	AREA (ha)
Sugarcane	33 700
Coffee	5 200
Tea	3 500
Fruits	5 400
Nut trees	800
Fodder	2 300
Sown pasture	4 500
Flowers	800
Total	56 200

Source: Department of Agriculture Engineering (2002)