

Water for Agriculture in Zimbabwe

Policy and Management Options for the
Smallholder Sector



Edited by
Immanuel Manzungu, Aidan Senzanje and Pieter van der Zaag

Water for Agriculture in Zimbabwe

Policy and management options for
the smallholder sector

Edited by
Emmanuel Manzungu
Aidan Senzanje
Pieter van der Zaag



UNIVERSITY OF
ZIMBABWE
Publications

©Emmanuel Manzungu, Aidan Senzanje, Pieter van der Zaag, 1999

First published in 1999 by

University of Zimbabwe Publications

P.O. Box MP 203

Mount Pleasant

Harare

Zimbabwe

Reprinted 2000

ISBN 0-908307-63-2

Printed by Mazongororo Paper Converters

Typeset by the University of Zimbabwe Publications.

Chapter 15	
A realistic approach to water reform in Zimbabwe	225
ALEX BOLDING, EMMANUEL MANZUNGU AND PIETER VAN DER ZAAG	
Chapter 16	
Towards integrated water resource management: A conceptual framework	254
EMMANUEL MANZUNGU, ALEX BOLDING AND AIDAN SENZANJE	
Epilogue	265
Index	271

Acknowledgements

Special thanks are due to the Netherlands Organization for International Cooperation in Higher Education (NUFFIC), The Hague, for providing financial support towards the hosting of the workshop upon which this book is based. NUFFIC also met part of the publication costs. The two coordinating committees of the Zimbabwe Programme on Women, Extension, Sociology and Irrigation (ZIMWESI), a NUFFIC-funded inter-university exchange programme in research and training between the University of Zimbabwe and Wageningen Agricultural University deserve special mention for the moral support they gave us.

We also wish to thank Dr Dayo Ogunmokun and Mr Edward Chuma of the Department of Soil Science and Agricultural Engineering, University of Zimbabwe, for their comments on the draft of this book. Dr Ogunmokun has, however, left the University of Zimbabwe.

Emmanuel Manzungu
Aidan Senzanje
Pieter van der Zaag

September 1998

Notes on Contributors

Alex Bolding is a PhD researcher with the Department of Irrigation at Wageningen Agricultural University in the Netherlands. Hosted at the Department of Soil Science and Agricultural Engineering of the University of Zimbabwe, he studied models and practices around socio-technical interventions in the Nyanyadzi catchment, Chimanimani district in eastern Zimbabwe. His research focused on agricultural extension, soil and water management, encompassing both dryland and irrigated agriculture.

Emmanuel Manzungu completed his PhD research in irrigation management with the Wageningen Agricultural University, The Netherlands, and is attached to the Department of Soil Science and Agricultural Engineering, University of Zimbabwe, which hosted his research. He is the author of a number of journal articles and book chapters. He has also co-edited the book *The Practice of Smallholder Irrigation: Case Studies from Zimbabwe* and *Researcher-Practitioner Dialogue on Smallholder Agriculture in Zimbabwe*.

Aidan Senzanje holds a PhD in Irrigation Engineering from Colorado State University, USA. He has several years experience in irrigation engineering

and management in Zimbabwe. He is a former Chairman of the Department of Soil Science and Agricultural Engineering at the University of Zimbabwe and lectures in Irrigation and Drainage Engineering. His main research interests are in the management of surface and drip irrigation systems.

CHAPTER 16

Towards integrated water resource management

A conceptual framework

E. MANZUNGU, A. BOLDING AND A. SENZANJE

As recently as 1995, Zimbabwe was said to lack an integrated water resource management strategy (Chatora, 1995). Mbetu (1995) stressed the need for the concept in relation to rural water supply. The same point was expressed by Taylor *et al.* (1996) in a project formulation document for the Mupfure catchment, a pilot project whose experiences will be replicated throughout the country. The need for integrated water resource management is not just the concern of technicians. Objecting to a proposal by Harare City Council to build Kunzwi Dam to augment the capital city's water supply, the Minister of Lands and Water Resources, in 1996, pointed out that this went against government's policy of integrated water development. One of the concerns was that if Harare City Council would build the dam, it meant that rural communities would have to buy water from the Council, which apparently was not acceptable to the Ministry. In this case integrated water development seems to imply that water transfers between sectors was to be through central government. Despite its popularity, integrated water resource management, surprisingly, remains undefined and unconceptualized perhaps on the assumption that it is self-explanatory.

This chapter suggests that integrated water resource management debate needs to be taken beyond its *prima facie* grounds if the concept is to yield fruit. According to the Collins Concise Dictionary Plus, *integrate* means *to make or be made into a whole*. If this is applied to the subject at hand, the question becomes what constitutes integrated water resource management? Stated differently, what exactly is being integrated in integrated water resource management? The task of the chapter is not just to argue for integrated water resource management but to sketch a conceptual framework. A conceptual framework can be regarded as a template incorporating (a set of) ideas about how a subject can be visualized and operationalized. A useful conceptual framework, we suggest, needs to come to grips with both theoretical and practical issues. In this context, theory is the conceptual lens through which integrated water resource management can be examined at close quarters so as to understand it

better. This is a necessary precondition to shed light on the subject. Shedding light in this case means isolating the essential elements of integrated water resource management. Once these elements are known, the practical or operational details can be fitted to complete the mosaic (the word mosaic is deliberately chosen to denote the complexity of the subject). Practical details are an important dimension if the concept is to avoid being esoteric.

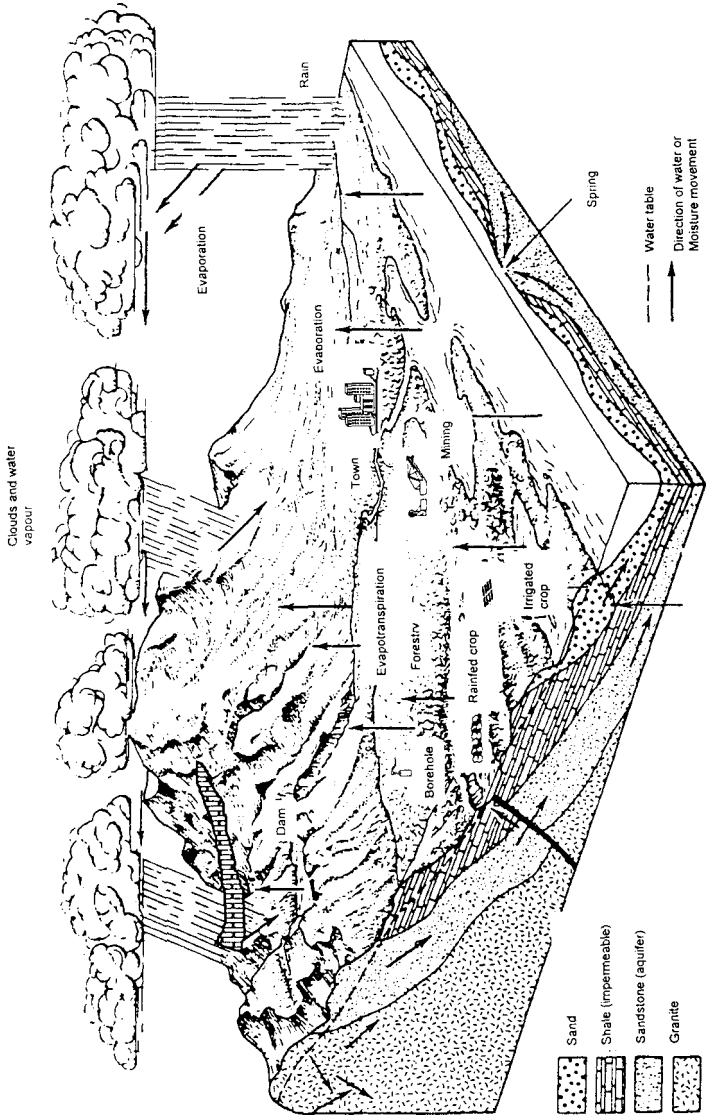
In identifying the essential elements of integrated water resource management, we draw our inspiration from nature — the hydrological cycle. We contend that a close look at the hydrological cycle can help find the building blocks of a successful integrated water resource management strategy. After drawing lessons from the hydrological cycle, attention is turned to isolating, in more concrete terms, the essential elements as well as laying out an operational schema. In the conclusion section we recommend that research is a necessary ingredient of integrated water resource management. We, however, submit that it is not just any type of research. Action research seems a worthy candidate in this venture.

LEARNING FROM THE HYDROLOGICAL CYCLE

Figure 16.1 represents an annotated hydrological cycle. There are three main points that can be gleaned from the cycle. Firstly, the cycle shows that it is problematic to think in simplistic terms of gains and losses in water resource management because losses in one part of the cycle are gains in another part of the cycle and vice versa. For example, evaporation and evapotranspiration in agriculture are regarded as losses. These two processes considered as negative to agriculture, are however, crucial as they drive plant productivity and thus contribute essential moisture addition to the hydrological cycle (SADC/IUCN/SARDC., 1996: 48). Processes such as seepage fall in the same category, because, although they lose surface water to the ground which represents net loss to irrigation, the same processes are useful as they recharge aquifers which sustain other users. Thus, as far as water resource management is concerned, notions of gains and losses are narrow and do little to help a sound integrated water resource management conceptual framework. What is important are the linkages between the various processes, be they physical, technical or social (see below). There is therefore a need to explore how urban, mining, industrial, agricultural and domestic water uses are linked. This is a significant point because, while the natural hydrological cycle has its checks and balances, these have largely been lost because of human activity. It is only sensible that people make the effort to restore the necessary balance.

A second point is that water can be seen as a natural, physical, social or economic product. It is a natural product in the sense that it is essentially a result of processes that are not man made. However, as can be seen in Figure

Figure 16.1 An annotated hydrological cycle



16.1, human activity significantly changes the course of these processes through various land and water-based practices such as crop production, animal grazing, forestry and irrigation. We contend that viewing water as a natural product, from a management point of view, is unhelpful as this masks the management challenges that have to be faced.

Water as a physical object is observable in its ability to cause erosion and siltation, both of which impact on water availability. It needs to be stressed that the physical attributes of water are not wholly negative. Its hydraulic characteristics, for example, are harnessed in irrigation. In the context of this chapter the important point is that the quantification of some of these physical aspects are increasingly seen not as cut and dried but as subjects of debate. For example, there have been questions asked on the concept of carrying capacity in grazing. Similarly, the environment as a legitimate water user is a developing notion whose merits have yet to be accurately quantified. This underlines the fact that the anthropocentric view that considers all water as only important for human use needs re-consideration (SADC/IUCN/SARDC, 1996). One theme emerging from all this is that knowledge, as will be highlighted below, seems absolutely crucial in integrated water resource management. It must be added that this should not be limited to scientific knowledge nor should it be thought that the knowledge is unchanging.

Water can be considered as a social product because it has to be shared by many people. Water as an economic commodity needs no introduction: this point has been stressed by many economists (see a critique of this in chapter 15). Sharing is, however, made difficult by the fact that water flows. This makes it impossible to completely apply the principle of excludability i.e. one cannot completely exclude water from other people unlike land where one can fence it off. As such regulatory mechanisms which define how water has to be shared are important. How the regulatory mechanisms are able to approximate the physical and social dimensions is a measure of success of that allocation system. The social dimension, it needs to be added, is far from homogenous. This is the third point: heterogeneity rather than homogeneity is the defining feature of integrated water resource management.

ESSENTIAL ELEMENTS OF INTEGRATED WATER RESOURCE MANAGEMENT

In order to be able to construct the essential elements of integrated water resource management, it is necessary to go back to the issue of heterogeneity. In the preface it was stressed that water reforms in Zimbabwe depended on crafting together heterogeneous elements that incorporated natural processes, technological aspects, social issues etc. From this a working definition of integrated water resource management can be given.

Integrated water resource management can be understood as striking a suitable balance between; (a) natural or artificial rainfall-enhancing factors (b) activities that affect surface and ground water availability and (c) allocation mechanisms that facilitate sharing of the available water. The first point (a) encompasses environmental issues while (b) relates to human social and economic activities such as agricultural production, urban, mining and industrial use. Under (c) sharing socio-economic, political and legal mechanisms designed to reconcile the competition for water among the various users.

This definition is similar to the one offered by SADC/IUCN/SARDC (1996). In one instance the document says that an integrated water management ethic incorporates the true value of water reflected in pricing structures and involves communities in water conservation measures on an on-going basis not only when droughts occur (p.84). It is further contended that such an approach requires that appropriate policies be applied which include (a) the provision of essential water supply and sanitation services to all citizens at affordable prices (b) equitable improvement of water supply through combined efforts of government based on community involvement and community participation, which must be on the basis of (c) environmentally sustainable development and utilization of water resources in satisfaction of various needs. A related point made by the same source is that the development and implementation of integrated water resources management plans must be designed to put in place mechanisms for equitable utilization and reasonable allocation of water resources.

Although the SADC/IUCN/SARDC document refers to all the points raised in our definition of integrated water resource management the same points are not included in the concept that is advanced. For example, factors and processes that affect rain and surface and groundwater availability are not specifically incorporated in the proposed management set up. Instead there is reference to water pricing and community participation. The same point can be made about Mbetu's (1995) concept, emphasizing community participation as it does. Much the same comment can be made with regards to Taylor *et al.*'s (1996) integrated water resource management which is basically an institutional model of how water can be shared. It is our view that although all the three concepts raise some important points, they, as we have already argued, fail to adequately highlight some vital linkages.

We also note that academia has not meaningfully contributed to the concept of integrated water resource management. Studies in Zimbabwe have tended to separate the three key aspects identified above treating each as a complete whole. This isolationist or disciplinary approach has produced in-depth knowledge of certain phenomena but has fallen short on how the three aspects are interlinked. For example, studies on rainfall stand on their own and are

seldom related to base flow characteristics of rivers or to aquifer inflows and outflows. Similarly, poor agricultural land use practices are mostly thought of as causing 'land degradation' with the linkage to water availability receiving no attention. It is not surprising therefore, that regulations have followed suit. Regulations regarding water allocation in Zimbabwe (and in other parts of the world) are in that sense illuminating. First there is a noticeable mismatch between the physical dimension and the regulatory framework as highlighted by the fact that water rights are defined in absolute volume terms which hardly gives an idea of the fluctuating river flows that have to be contended with (see van der Zaag and Roling, 1996; Bolding *et al.*, this volume). Second, the system recognises and rewards 'net consumers', i.e. those using the base flow and not those that contribute to enhanced flows through good land husbandry practices. Box 16.1 illustrates how human activity can impinge on water 'creation'.

Box 16.1 Effects of agriculture and mining on water availability

Clearing land for agriculture increases runoff and decreases infiltration rates, lowering the water table, particularly where dry weather conditions persist.

Arable farming and intensive grazing can increase surface runoff, trampling and ground compaction can decrease base flow as infiltration to groundwater aquifers is hampered.

Conversion of indigenous forests to plantations of fast growing pine and eucalyptus species increases evapotranspiration rates and reduces dry-season flow of rivers and streams.

Mining can result in excessive water extraction, water contamination by toxic substances, harmful substances may be ingested by animals or may cause respiratory problems as well as causing vegetation destruction and erosion.

Source: SADC/IUCN/SARDC, 1996

As already stated the present water allocation system in Zimbabwe offers no incentives for 'creating' water. Presently people 'assume property to water' in two but related ways. Entitlements are gained through the administrative realm through water rights application or through investments (capital and labour for example) to harness the water especially in the case of storage rights. People who contribute to better water flows by enhancing rainfall or water-enhancing practices are invisible in the present allocation system. This, we argue, does not result in integrated water resource management.

The important point that needs to be reiterated at this juncture is the link between environmental management and base flow or water availability in

general. The environment, it needs to be realized, is often not free of human activity. For example in Zimbabwe, which also applies to other developing countries, many people live off the land. The environment is thus a source of livelihoods to many. Because of poverty the environment becomes a victim (Box 16.2).

Box 16.2 Poverty and environmental degradation

Poverty in southern Africa has been described as "one of the root causes of environmental degradation" and poses a threat to human health. It is generally believed that poverty and environmental degradation are linked in a vicious circle . . . When people lack adequate financial as well as other resource [or basic needs, for short] they often have little choice but to take what they can from the natural environment to meet their needs, without consideration for the future.

To meet the food requirements of an increasing population, forested or grazing land may be brought under cultivation, and irrigated production intensified. Yet research shows that clearing of vegetation may modify rainfall, leading to a drier climate in certain ecological zones.

Source: SADC/IUCN/SARDC, 1994

The foregoing remarks about integrated water resource management can be conceptualized and leads us to how it can be operationalized. This is the aim of the next section.

MAKING INTEGRATED WATER RESOURCE MANAGEMENT OPERATIONAL

One of the important points about integrated water resource management, apart from its conceptualization, is how it may be implemented. In this regard, there is little to fault in the statement that water resources need to be managed at the lowest appropriate level since centralised top-down management has often proved inadequate to address local water management needs and fails to involve local communities (SADC *et al.*, 1996: 201). One of the problems of centralized water management is that the management structures invariably do not coincide with physical, hydrologic or social units. It appears then that one of the challenges facing operationalizing integrated water resource management is to define the operational management unit. In recent years a catchment (area) has been proposed as such an operational unit. A catchment (area) refers to the area which naturally drains into a dam, lake, reservoir, river or watercourse and from which area the dam, lake, reservoir, river or watercourse receives

surface or underground flow which originates from rainfall (Zimbabwe, 1996). Catchment management denotes the need to consider all human activities in each river or stream basin, all water sources and wetlands and the ways in which these interact (SADC *et al.* 1996: 69).

A catchment approach helps to shed light on how the various heterogeneous elements on integrated water resource management are connected. A catchment by definition is aligned towards hydrology. Thus hydrological data are the expected outcome which are normally used to decide on water allocations. One can, however, see beyond the hydrologic dimension of the catchment and see it as composed of many players (irrigators, rain-fed crop producers, firewood collectors, rural growth points, industries, mining concerns, primary water users) whose agenda may conflict. This collection of players can either enhance water in the catchment through good management that enhances rain or water availability or worsen it. Although rain-enhancing processes are usually considered to lie outside the remit of human capability, de Groen and Savenije (in this volume) seem to suggest that there is a need to rethink the issue. Once this fundamental issue is appreciated then water allocation has to take account of this fact as we suggest here. The same principle can be applied to activities that affect base flow. There is no need why people in the catchment who grow exotic trees that decrease base flow should not be held responsible for their actions. Similarly, agricultural producers that increase erosion and siltation and consequently affect base flow should be treated the same. Polluters of water sources should also be treated likewise. The complementary practical mechanisms may not be easy to come up with. Both punitive and incentive measures should be relied on since punitive action on its own is not enough. So while fines can be imposed, practical incentives are needed. For example, those that contribute to water availability can have increased share of the water resources. The reverse should apply. Environmental 'subsidies' that reward good managers of the environment and by default the water, can also be used.

These ideas work only if the different actors are convinced about their merits. More information, not just to experts but to lay people, is needed. From our perspective a research agenda must be guided by the aim to find out the linkages between water management practices of the various players in the catchment and the effects of these on water availability. The emphasis is on the practices, what actually is happening. Such a study necessarily includes a number of elements which makes the study multi-disciplinary. But if linkages are to be uncovered then interdisciplinarity may be the way forward as the aim becomes to integrate rather than separate the different elements.

This means getting to grips with controversies around quantitative aspects of soil erosion, siltation, 'safe' carrying capacities of land in relation to livestock, for example.

Then there is the whole question of the characteristics of the fragile savannas, which predominate Zimbabwe and southern Africa, in relation to the land use activities therein.

The value of local knowledge when dealing with such unstable situations may prove invaluable (Wilson, 1995) although this may be used as political resources to legitimate some position especially the chiefs who are regarded as custodians of socially-embedded local knowledge (Makamuri, 1995). Whatever the controversies, local perspectives to the environment in general and water in particular remain important as they determine to a large extent the success of intervention projects.

Institutions play an important role in integrated water resource management. For these institutions to succeed they must be based locally (see below). The power dimensions in institutions should not be underplayed. Particularly in the rural areas there is a need to go beyond leadership stereotypes (Box 16.3).

Box 16.3 Leadership stereotypes must be avoided

The planning process needs to be able to mediate between a range of interests and to synchronize the objective of sustainable development, incorporating various levels of civil society. Simply incorporating community leadership groups does not adequately deal with the heterogeneous nature of, and the power relationships within, a society. Existing leadership structures in any society tend to reflect the dominant values of society. For women are unlikely to be well represented by male community leaders.

The same applies to farmer groups which may be dominated by men.

Users must represent themselves. In Africa there is a tendency to let civil servants represent farmers.

Institutions must reflect the different users and must not be based on some convenient formula.

Effective institutions can bring about efficient utilization of resources. As remarked by Moore (1989) these may be the surrogates that the market approach has to settle for. On the subject of private enterprise and markets in the water sector it is important to remember that markets may deepen existing inequalities as markets contain a lot of imperfections (SADC/IUCN/SARDC, 1996: 210).

CONCLUSION: THE NEED FOR ACTION RESEARCH

Integrated water resource management, as we have discussed here, provides no easy solutions. This may be regarded as the Achilles heel of the concept we

have advanced here. We suggest that simple solutions should not be at any cost. The subject of integrated water resource management is one subject which does not need simple and convenient solutions. We argue that this complex subject can be unravelled especially in the context of the setting up of manageable operational units.

It is also true that catchment councils or whatever bodies are set up have also to generate information upon which to base their decisions. From that perspective extensive monitoring is necessary. This implies that these bodies will be more than water allocation authorities which is just one aspect of integrated water resource management. It appears to us that on-going generation of data is an integral part of the exercise. Research is clearly necessary but not just any kind of research.

The challenges are that the system under study cannot be controlled. It is also dynamic in terms of the physical conditions as well as the social processes at play. Only action research can come to grips with such situations that are internally and externally changing. A possible research inventory must link together the following;

- Rainfall patterns and river and aquifer hydrology
- Erosion in irrigated and rain-fed plots and grazing areas
- Siltation in rivers and dams
- Forestry, deforestation/afforestation effects on surface/base flows
- Water allocation practices including underground water
- Institutional and legal aspects
- Impact on water quality on mining and urban water use.

Research is only profitable if it is put to effect. Policy making and implementation must be on the basis of concerted efforts. As such policy makers and planners need to be interested in research programmes. On their part researchers must target policy makers as a legitimate audience of their results. This means that there is a need for researchers to be able to communicate their results in understandable language (Murphree, 1997: 10).

REFERENCES

- Chatora, C. 1995. The resource water. Paper presented at the University of Zimbabwe/ ZIMWESI workshop 'Extension intervention and local strategies in resource management: new perspectives on agricultural innovation in Zimbabwe, Harare, 10–12 January 1995.
- Mbetu, Ramson, M. 1995. Water as an integrated resource: the way to sustainable community development. Paper presented at the ITN conference, Harare, December 1995.
- Mukamuri, B.B. 1995. Local environmental conservation strategies: Karanga religion, politics and environmental control. *Environment and History*. Volume 1. No. 3. 297–311.

- Murphree, M.W. 1997. Strategic considerations for enhancing scholarship at the University of Zimbabwe. *Zambezia*. Volume 24. No. 1. 1–11.
- SADC/IUCN/SARDC. 1994. Water in Southern Africa. Southern Africa Development Community/IUCN The World Conservation Union/Southern African Research and Document Centre.
- Taylor, P., C.Chatora and J.P. M. Hoevenaars. 1996. Mupfure catchment integrated water resource management: project formulation.
- Wilson, K.B. 'Water used to be scattered in the landscape': local understandings of soil erosion and land use planning in southern Zimbabwe. *Environment and History*. Volume 1. No. 3. 281–296.
- Zaag van der, Pieter and Neils Roling. 1996. The water acts of Nyachowa catchment. In Emmanuel Manzungu and Pieter van der Zaag (eds.) The practice of smallholder irrigation: case studies from Zimbabwe. University of Zimbabwe Publications, Harare.
- Zimbabwe. 1996. The Water Act. Chapter 20:22.



This work is licensed under a
Creative Commons
Attribution – NonCommercial - NoDerivs 3.0 License.

To view a copy of the license please see:
<http://creativecommons.org/licenses/by-nc-nd/3.0/>

This is a download from the BLDS Digital Library on OpenDocs
<http://opendocs.ids.ac.uk/opendocs/>