

# ZIMBABWE'S AGRICULTURAL REVOLUTION REVISITED

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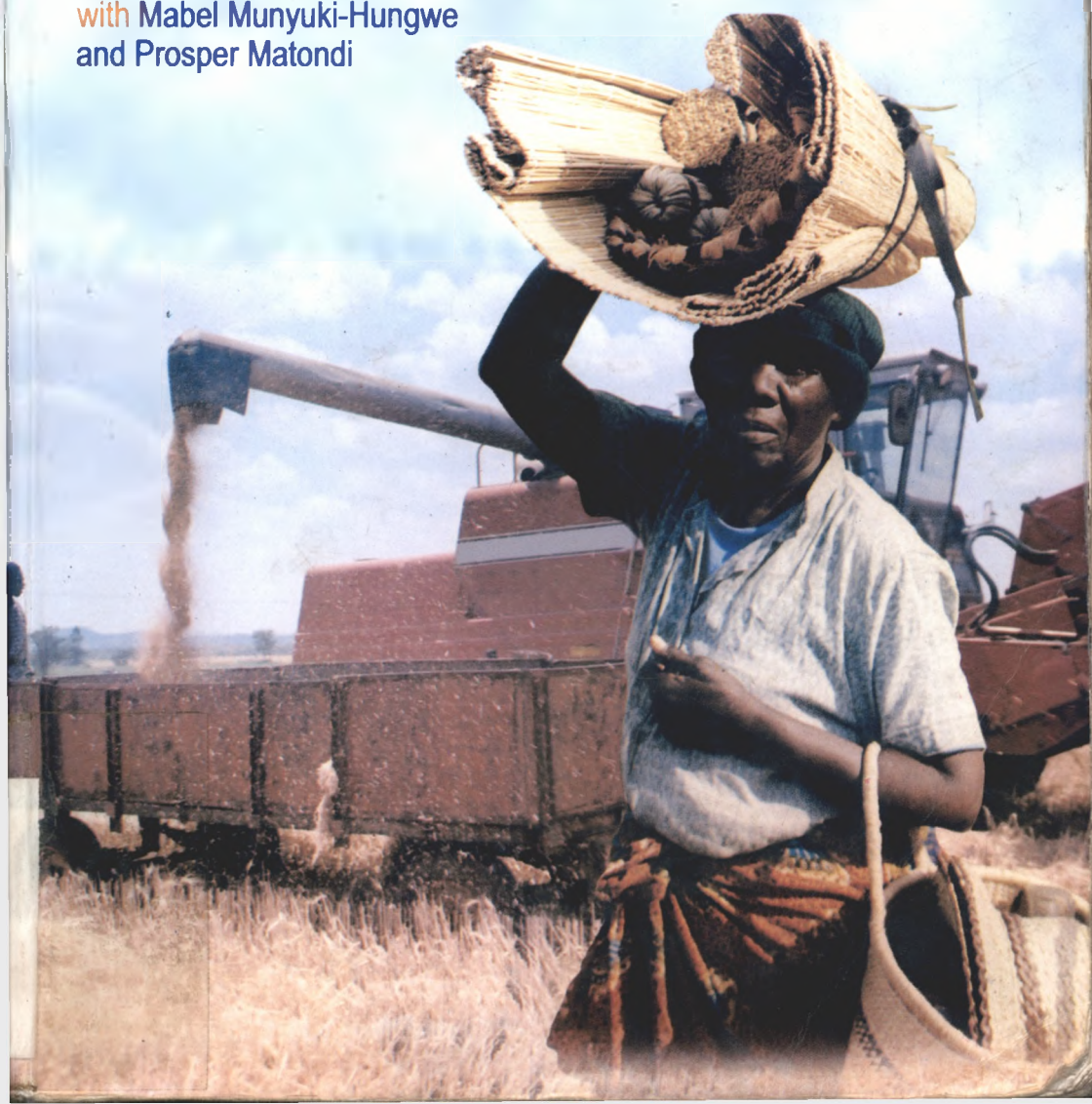
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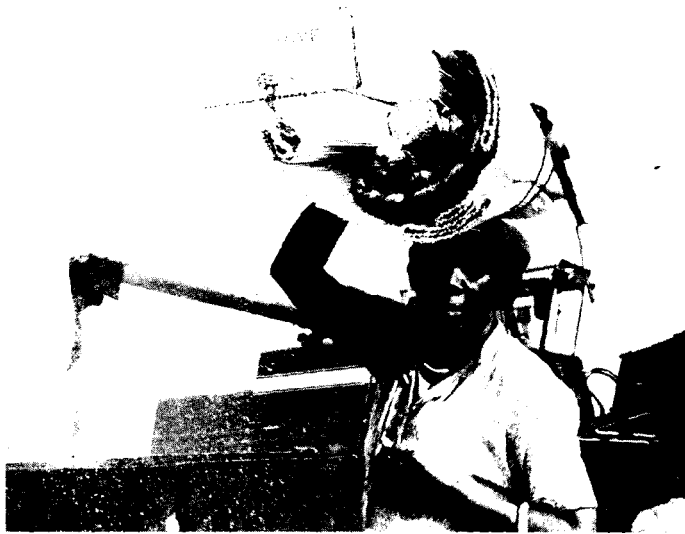
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U.Z

**P**ublications

## PART III THE PRIME MOVERS

<b>Introduction to Part III .....</b>	<b>191</b>
<b>8 Agricultural research policy .....</b>	<b>197</b>
<i>Patrick H. Tawonezwi and Danisile Hikwa</i>	
Status of research before UDI .....	197
Agricultural research during UDI .....	200
Agricultural research policy: 1980–2003 .....	202
Building and maintaining agricultural research capacity .....	207
Implications for the future .....	209
Conclusion .....	210
<b>9 Agricultural extension .....</b>	<b>217</b>
<i>Simon C. Pazvakavambwa and Marcus B. K. Hakutangwi</i>	
Extension before independence .....	217
Extension services after independence .....	220
Extension approaches .....	222
Research and extension linkages .....	228
Conclusion .....	231
<b>10 Development of the seed industry .....</b>	<b>235</b>
<i>Ephraim K. Havazvidi and Rex J. Tattersfield</i>	
History of the seed industry .....	235
Seed legislation and implementation .....	241
Plant breeding .....	243
Seed technology research .....	247
Production levels, distribution and pricing .....	249
The national and regional effects of the seed industry .....	251
<b>11 Irrigation development and water resource management .....</b>	<b>255</b>
<i>Johannes Makadho, Prosper B. Matondi and Mabel N. Munyuki-Hungwe</i>	
Water sources, irrigation and potential irrigable land .....	256
Types and distribution of irrigators .....	258
Smallholder wetlands management .....	261
Principles of water resources and irrigation management .....	262
Irrigation technology development .....	265
Funding irrigation activities .....	266
Institutional structure .....	267
Irrigation development and water resource management .....	269
Policy and legal framework .....	271
Looking ahead .....	273
Conclusion .....	275



**Recurrent droughts have highlighted the need to harness water for irrigation**

# Irrigation development and water resource management

*Johannes Makadho, Prosper B. Matondi  
and Mabel N. Munyuki-Hungwe*

In tropical and sub-tropical regions water is a highly variable natural resource subject to seasonal as well as long-term climatic changes. In Zimbabwe rainfall is the single most important climatic factor affecting crop production. The struggle for access to and use of water resources is regarded as the second most important conflict after land (Matiza-Chiuta, 2000). Smallholder irrigation has always had a political dimension as it embodies land and water, two of the most contentious issues in Zimbabwean history (Rukuni, 1984).

Water access tensions are omnipresent between smallholders, large-scale farmers and users.<sup>129</sup> The problems in the water sector include: competition for a scarce and finite resource between and among large-scale and smallholder farmers; poor water resource management; declining quality of the limited resource; disappearance of expensive irrigation infrastructure during the land transfers; competition for state-generated finance; lack of a common policy or benchmark by which to judge actions in the sector; a narrow band of stakeholder involvement in the sector; too little coordination; and recurrent drought.

The political changes brought about by the fast track land reform programme have renewed the debates on access to water for irrigation purposes. The successful implementation of water reforms in the late 1990s<sup>130</sup> were overshadowed by the political conflict over land. Land distribution largely ignored the issue of the allocation of water resources. However, the droughts of 2001 and 2002 coincided with the implementation of the fast track land reform and brought the water access issue to the forefront. Conflicts arose over the allocation of land endowed with water, resulting in theft and destruction of equipment on settled farms. Conflicts also sprung up over government financing for irrigation rehabilitation and highlighted the importance of irrigation for enhanced agricultural productivity. This chapter discusses the evolution of the irrigation sector, analyzes water sector reforms and presents an inventory of water resources and the characteristics of the irrigable land. The chapter also examines

<sup>129</sup> Smallholders have always had limited access and inadequate state support in matters of water resources. The policy and legal framework before and after independence tended to favour large-scale water users.

<sup>130</sup> The Water Act (1998), created the Zimbabwe National Water Authority (ZINWA), catchment and subcatchment councils, and issued water permits on an equitable basis.

water resources management, technology development, the legal, policy and institutional framework of the water sector, and concludes by examining the prospects for irrigation in the next decade.

### **Water sources, irrigation and potential irrigable land**

Surface water contributes 90 per cent of the country's water supply and the rest comes from groundwater. Zimbabwe's agriculture is dependent mainly on rainfall. Yet rainfall is the greatest source of risk and uncertainty. The husbanding and reallocation of water resources through in-field conservation, dam construction or groundwater abstraction are all core strategies to reduce risk.

Surface water resources have been calculated from estimates of mean annual runoff in six hydrological zones identified by letters A to F on the hydrological map of Zimbabwe (Rukuni, 1984). The estimates show that the average total annual runoff in the country is 19,900 million cubic metres. Of this, the potential yield of surface water is estimated at 11,260 million cubic metres. The yield that can be exploited is 75 per cent of the potential or around 8,500 million cubic metres. Of the exploitable potential, about 4,900 million cubic metres are usually used up. This leaves an estimated 3,600 million cubic metres unused. Comparing present available water to the potential available for further development, Mazowe, Sanyati and Save catchments have a higher potential for further development of storage. The least exploited basin is the Ruenya-Pungwe with only 7 per cent of the water exploited and the most exploited basins are the Shashi and Bubi-Runde with 77 per cent exploited.

There is little information on groundwater potential in Zimbabwe but it is known that large aquifers exist in the Save valley and in northern Matabeleland. The sedimentary geological formation in the north of the country yields fairly good groundwater but the granites, which are the most extensive geological units, only yield around 800 gallons per hour. In Nyamandlovu, northeast of Bulawayo, there is an aquifer perched in a sedimentary basin of the Karoo system with an average yield of 0.01 cumec (1/3 cusec) of water (Makadho and Rukuni, 1994). At the same time Zimbabwe's Kariba dam has the potential to irrigate over a million hectares of land. However, the Zambezi valley has large tracts of sodic soils which are not irrigable. The potential for exploiting the Kariba dam water for irrigation is very limited and can only be used in the Zambezi valley (Mushumbi Pools) with a large block of good alluvial soils (Makadho and Rukuni, 1994). Moreover, the Zambezi is a riparian resource shared among seven states, which requires adherence to international agreements on shared waters.<sup>131</sup>

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<sup>131</sup> These countries are Angola, Botswana, Malawi, Mozambique, Namibia, Zambia and Zimbabwe.

Most formal irrigation systems depend on water stored in more than 10,000 dams in Zimbabwe. Of the available dams, around 5,700 small and medium ones have been constructed privately on commercial farms, estates and plantations. The remainder are government-owned dams found in large-scale commercial areas and in the smallholder sector. The Department of Irrigation (2003) estimated that there was unused water in 23 government dams that could irrigate up to 15,600 hectares (Manzungu, 2003). Water for irrigation is supplied through a complex and growing infrastructure of dams and boreholes. The District Development Fund, a quasi-governmental agency responsible for the installation and maintenance of public sector rural water facilities, has listed some 24,300 boreholes used primarily for drinking and stock water.

The estimated maximum irrigable area in Zimbabwe is 550,000 hectares, of which 200,000 hectares have been developed (Manzungu, 2003). This includes functional and non-functional irrigation systems, as well as informal irrigation schemes. On the basis of physical criteria, only an additional 200,000 to 250,000 hectares can be irrigated (FAO, 1990). The irrigation subsector accounted for more than four-fifths of the 80 per cent of developed surface water abstraction. However, of the 119,000 hectares of land irrigated, only some 2,000 hectares belong to smallholders. Hence, the major portion was in the large-scale commercial sector. The Save valley has the potential to irrigate an additional 100,000 hectares. Irrigable alluvial soils are available in localities along the Save catchment areas whilst at Chisumbanje, over 50,000 hectares of vertisols (heavy black basalt clays) are available. Another area of major expansion potential for irrigation exists on the Tokwe-Mukosi basin, where government has embarked on dam development. This dam could allow for the expansion of up to 35,000 hectares without storage works but could increase to about 100,000 hectares with storage works (Makadho and Rukuni, 1994). Other notable areas for future irrigation development are along the Mupfure river and in the Mazowe valley. The combination of good soils and potential for hydrological works offers opportunities for more irrigation development.

Most of the potential sites mentioned are on land that used to be under large-scale commercial farms. The scope for developing irrigation in communal areas and old resettlement schemes is limited. There is little recorded information on the potential of the soils in the communal areas. In the first resettlement programme, concluded in 1997, mostly land in natural regions III and IV without irrigation potential was acquired. Given that few soil surveys have been conducted, the scope for irrigation planning was limited in these resettlement areas. In general, communal areas have the poorest soils with few large areas of flat irrigable soils. About three-fifths of the country is covered by granites which give rise to the sandy soils found in most communal areas. The soil potential for irrigation in communal areas and old resettlement schemes would require the development of numerous small schemes.

## Types and distribution of irrigators

Irrigation is practised across most of the farming systems. These can be grouped into large-scale (A2,<sup>132</sup> remaining large-scale commercial farmers, government estates and private estates) and small-scale (old resettlement, A1,<sup>133</sup> communal, small-scale commercial). The size of the irrigated area in the communal and resettlement areas has changed marginally. Prior to the fast track land reform programme, the average irrigated area in the large-scale commercial subsector was approximately 100 hectares per farm while in the smallholder sector, it ranged from 0.1 to 2 hectares.<sup>134</sup> In 1997, in the communal and resettlement areas, there were 178 irrigation schemes with a cumulative area of 11,593 hectares. The most irrigators were in Matabeleland South with 34,477 irrigators. In terms of operational irrigated land, Manicaland had the most with 3,327 hectares.

**Table 11.1 Smallholder irrigation schemes in communal and resettlement areas, 1997**

Province	No. of operational schemes	Area of operational schemes (ha)	Total number of beneficiaries
Matabeleland South	21	1,580	34,477
Masvingo	39	2,257	2,763
Manicaland	28	3,327	3,912
Midlands	33	970	2,885
Mashonaland East	35	440	861
Mashonaland Central	8	641	253
Mashonaland West	14	378	426
Small-scale purchase areas	–	2,000	–
Total	178	11,593	45,577

Source: AGRITEX estimates and Chitsiko (1997)

<sup>132</sup> A2 is a model designed by government during the fast track land reform programme. It is aimed at accommodating black commercial farmers with their own farming resources.

<sup>133</sup> The A1 model is aimed at accommodating poor farmers from congested areas, farmworkers, and so on. An average of six hectares is allocated per beneficiary. The beneficiaries live in communal-like villages.

<sup>134</sup> Data are not available on land under irrigation per farm. In general the best performing farmers have less than 50 hectares under irrigation.



The state is mandated to spearhead agricultural and rural development, including irrigation through the Agricultural and Rural Development Authority (ARDA). It controls 26 estates with a total area of about 13,500 hectares. In the 2002/03 farming season, ARDA had an irrigated area estimated at 7,620 hectares (table 11.2). In 1997 settler farmers adjacent to ARDA and private large-scale estates were using some 3,600 hectares. Outgrowers had various forms of contracts with ARDA estates. Before agricultural liberalization in 1990, settlers grew the same crops as ARDA with the latter providing technical assistance, tillage, crop inputs, labour and the market at a fee. The irrigated area commanded by ARDA had grown following the government's decision to acquire large estates in 2003/04.<sup>135</sup> The A1, A2 and indigenous large-scale commercial farmers now account for about 30 per cent of the irrigated area. ARDA also has 528 outgrower schemes cultivating some 1,420 hectares.

Due to the land reform programme, the quality of land distributed varied across the provinces, depending on agro-ecological potential and the distribution of water and irrigation resources. In general, A1 farmers received the least proportion of land with high potential for irrigation: they received 6 per cent

**Table 11.2 Distribution of irrigated area before and after the 2000**

Category	Before 2000		After 2000	
	Area (ha)	% of total	Area (ha)	% of total
<b>A1</b>	n/a	n/a	7,620	6.3
<b>A2</b>	n/a	n/a	12,450	10.3
Communal and resettlement	10,000	6	11,860	9.8
Indigenous large-scale commercial (or informal)	20,000	11	9,250	7.7
Traditional large-scale commercial (white-owned)	139,500	73	8,140	6.8
<b>ARDA</b>	13,500	8	7,620	6.3
Estates			63,470	52.3
<b>Settler</b>	3,600	2		
<b>Total</b>	186,600	100	120,410	100

Key : n/a = not applicable

Source: Department of Agricultural Engineering (2002), IFAD (1997)

<sup>135</sup> *Zimbabwe Independent*, 'Kondozi acquisition', 16 April 2004.

(7,618 hectares) of national irrigable land whilst A2 beneficiaries received a little more with 12,448 hectares (10 per cent) of the total operational irrigated area (Manzungu, 2003). The highest number of operational irrigable lands of approximately 92,000 hectares (74 per cent) was in large farms and agro-industrial estates (private sector and public sector, like ARDA and various institutions).

The country lost 66,190 hectares of irrigation land between 1997 and 2003 due to the droughts in 2000 and 2002, and the land reform programme which caused conflicts over new farmers' access to irrigation infrastructure, including theft of movable irrigation equipment which reduced the area under irrigation. The largest reduction of irrigated land was on former large-scale commer-

**Table 11.3 Distribution of irrigated area (ha) after 2000**

Province	A1	A2	Comm. & reset.	Indig. LSCF	Rem. LSCF	ARDA	Others	Total
Mashona- land 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	13,500	43,900
Mashona- land Central	2 000	2,450	760	6,220	3,050	100	320	14,900
Matabele- land South	70	1,200	1,400	—	100	940	—	3,710
Matabele- land North	340	70	200	170	270	400	—	1,450
Mashona- land 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
Grand 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	52.7	100

Key: Com & reset. = Communal and resettlement land  
Indig. LSCF = Indigenous large-scale commercial farming  
Rem. LSCF = remaining large-scale commercial farming  
ARDA = Agricultural and Rural Development Authority

Source: Manzungu, (2003)

cial farms which declined from 73 per cent to 6.8 per cent (Utete, 2003).

Patterns of water and irrigation resources distribution have tended to vary according to provinces and agro-ecological distribution. The best agro-ecological zones are located largely in the highlands (watersheds) of Mashonaland Central, Mashonaland East and Manicaland and have the largest irrigated areas at 13,820 hectares (69 per cent of the irrigated areas under resettlement). Manicaland and Masvingo provinces account for the largest area of irrigation (table 11.3). In Manicaland, tea and coffee estates, ARDA run estates, Dairi-board of Zimbabwe Limited dairy farms, and large horticultural farms account for the largest irrigated area. Manicaland also accounts for the most communal and resettlement irrigators, with an area of 4,180 hectares. In the Mashonaland provinces, Mashonaland Central with 14,900 hectares accounts for most of the irrigation. A belt with good soil for irrigation is found in Mazowe valley, Lomagundi, Trelawney and Shamva areas. The availability of water and proximity to Harare are major determinant factors. Mashonaland Central has the largest number of indigenous farmers<sup>136</sup> who irrigated a total of 6,220 hectares.

In Masvingo, most of the irrigation is used by large estates to produce citrus fruits and sugar cane. The area under sugar cane (43,000 hectares) has been static from 2000 to 2004. Sugar production declined during the 1992 drought and recovered to stabilize at about 600,000 tonnes after 2000. The area under irrigation marginally improved in 2004 in all the provinces due to the subsidies provided by the state for winter wheat production and support from the Reserve Bank of Zimbabwe for irrigated tobacco for the 2004/05 production season.

### Smallholder wetlands management

Smallholder irrigation using wetlands (*dambos*) has existed in Zimbabwe for many years. Studies have shown that *dambos* are self-sustained, highly productive and contribute to the social and economic welfare of many rural families (Matondi, 2001; Sithole, 1999). Between 15,000 to 30,000 hectares of land are used for *dambo* cultivation through typical small vegetable gardens of less than a hectare. However, Whitlow (1984) calculated that *dambos* cover 1.28 million hectares or 3.6 per cent of the total land area in Zimbabwe. Of the total, 262,000 hectares (25 per cent of total) are in communal lands.

In the smallholder sector, the use of *dambos* (wetlands) in vegetable gardening is increasing. Zimbabwe prohibits the use of wetlands without the consent of the Minister of Environment (Environment Management Act). A number of state bodies – such as the Department of Agricultural Research and Extension, Department of Natural Resources, Local Government, Forestry Commis-

<sup>136</sup> These are black large-scale farmers who bought large-scale commercial land before 2000.

sion and Home Affairs – have provisions in their statutes that prohibit the cultivation of these fragile lands. Traditional institutions (spirit mediums, chiefs, headmen, elders) also prohibit certain uses of *dambos*. Finally numerous non-governmental organizations, universities and research institutes carrying out research activities on the use of *dambos* often create further areas of conflict and confusion. This is based on some of their recommendations that prohibit certain uses or the modification of water sources on *dambos* that lead to them drying up. With the right technology and protection of this fragile environment, smallholder farmers have grown wheat, beans, grass for fodder, rice and vegetables in *dambos* (Khombe, Munyuki-Hungwe and Tirivanhu, chapter 32).

*Dambo* use is one component of a livelihood strategy that is dependent on other components such as livestock and non-agricultural activities. There are also other resources of value found on *dambos* (trees, reeds, fish ponds, brick-making sites, grazing areas, sacred sites, sacred graves and springs) that are of value to the communities. Given the importance of *dambos* to rural livelihoods, they have tended to attract the attention of many institutions in their management. Such institutional intervention is based on desire to control the resource itself for environmental, conservation or religious reasons. On the other hand, an element of the desire is also to control the people using the resources for organized exploitation of the resources (Matondi, 2001). Increasing water efficiency and expanding the areas of *dambo* cultivation are options that need to be pursued continuously as they have the potential to increase food security in the smallholder sector.

## Principles of water resources and irrigation management

The major use of water in Zimbabwe has been irrigated agriculture followed by domestic and industrial consumption. Water increases productivity through early season irrigation and improves farm productivity through dry season irrigation. In general, irrigation increases water security and therefore leads to a more secure and productive farm enterprise. Much of the success of Zimbabwean commercial agriculture rested on the great expansion of private irrigated agriculture in the drought years in the 1990s. Irrigation represents the most important interface between water and land resources. Government has over the years initiated many small-scale irrigation schemes (largely in communal areas) while commercial farms have sustained extensive large-scale irrigation systems accounting for over 85 per cent of irrigated cropland in the 1980s and 1990s.

Table 11.4 presents the relative contribution of irrigated production for selected commercial crops. In the large-scale commercial farming subsector the main irrigated crops grown include wheat and sugar cane, followed by tobacco, cotton, tea, coffee, citrus and horticultural crops (mange tout, baby corn, as-

**Table 11.4 Crops grown under large-scale irrigation**

Crop	Average (1980–90) hectares	Average (1991–99) hectares	Average (2002/3) hectares
Wheat	33,659	42,587	51,540
Sugar cane	32,711	36,950	40,784
Cotton	19,817	9,549	—
Maize (winter)	18,035	12,498	15,000
Soyabeans	14,035	17,209	20,000
Vegetables	7,501	—	—
Flue-cured tobacco	7,415	20,991	—
Coffee	5,957	4,329	7,500
Barley	4,501	4,997	—
Tea	2,340	3,207	5,800

Source: CSO (1980–2003)

paragus and peas). Wheat, grown in winter, however, takes up the largest hectareage of 51,540 which reflects an increase from the past (table 11.4).

Supplementary irrigation for cotton, soyabeans and maize has been significant due to inconsistencies in rainfall. Horticulture emerged as a growth area in terms of volume and value of outputs as well as the range of crops grown and has continued this upward trend (Heri, chapter 19). Crops grown in smallholder irrigation schemes include maize, cotton, wheat, tomatoes, leafy vegetables such as kale, and other horticultural crops for home consumption and marketing. The large agro-corporations produce citrus and sugar under canal irrigation in Mazowe and in the lowveld.

The large-scale and smallholder schemes differ in their approach to water management. The large-scale farms have a structured institutional management system from farm level to their union. The smallholders use irrigation management committees that rely heavily on persuasion to enforce water management practices. The government and large-scale commercial farmers are the largest employers of skilled irrigation engineers and specialists. The increase in irrigation activities in the large-scale farms contributed to the development of linked industries that include pipe making, pumping equipment and engineering consultants.

Water sources for the new smallholder schemes have been predominantly river flow, reservoir storage and deep, motorized boreholes. Three broad types of smallholder schemes are common in Zimbabwe: government-managed irrigation schemes, farmer-managed schemes and the jointly managed smallholder irrigation schemes (table 11.5). The three groups differ in their approach to the operation and maintenance of their irrigation systems. On government managed schemes, the operation and maintenance of the irrigation infrastructure is the responsibility of central government. Community managed schemes are run by farmers through their own committees. In jointly managed schemes, central government and farmers share the management and costs. In general, community run schemes have performed better than government managed schemes because of their flexibility, lower costs of operation and maintenance, and more participation of women (Munyuki-Hungwe, 2001; Rukuni, 1995).

A number of problems have befallen irrigation schemes that are managed by central government departments, such as: poor marketing arrangements; limited access to water; inability to meet operational costs due to poor fee structures and the lack of a sense of ownership; financial viability; and poor govern-

**Table 11.5 Zimbabwe: Types of smallholder schemes and sources of water, 2000**

Province	Total area (ha)	Govt managed (number)	Jointly managed (number)	Farmer managed (number)	Source of water	
					Surface	Sprinkler
Matabeleland South	1,234	16	3	2	20	1
Masvingo	2,796	22	3	14	34	5
Manicaland	4,248	5	13	11	25	4
Midlands	695	13	6	14	29	4
Matabeleland North	169	4	4	0	8	0
Mashonaland East	378	0	0	35	5	30
Mashonaland Central	659	0	2	6	6	0
Mashonaland West	821	1	2	11	8	6
Total	11,000	61	33	93	129	58
Percentage		32	18	50	69	31

Source: Department of Agricultural and Technical Extension estimates (1998), FAO (2000)

ance (Senzanje, 2000, Munyuki-Hungwe, 2001). Some of these problems have necessitated government transferring responsibility to farmers. The government, however, has often failed to recognize traditional common property systems of water management. Whilst in communal areas of Zimbabwe common property resources, such as land, water and grazing rights, are often determined and administered at village level by chiefs, irrigation schemes are managed by government (Senzanje, 2000, Munyuki-Hungwe, 2001). In turn, governments have tended to enforce rigid land and water regulations and tended to ignore the realities of social organizations in rural Africa (*Spore*, 2000). Smallholder irrigation has tended to be seen as eroding the social functions of village systems and make them mere beneficiaries of resources and services (Munyuki-Hungwe, 2001).

The near collapse of the irrigation sector during the fast track land reform period contributed to a reduction in output on large farms. Given that the country experienced two consecutive droughts when massive land transfers were taking place the government had to intervene through cheap funding because irrigation was disrupted. Moreover, the emerging principles and management regimes in the new A1 and A2 farms were still weak. Most of the current irrigation activities were riding on the back of state support which was not sustainable. Some of the key problems in all the sectors include poor water use, inadequate water and poor crop husbandry leading to poor production due to moisture stress. Even in 2004, crop yields were still way below those achieved in the commercial farming sector.

## **Irrigation technology development**

There are numerous irrigation technologies in Zimbabwe. The basic thrust of technology development has been to use water efficiently and minimize the cost of system maintenance. Irrigation technology used in Zimbabwe has developed over time and it ranges from overhead sprinkler irrigation, canal systems, drip and centre pivot systems through to the bucket system. Some of the irrigation technologies are suitable for very small farms, such as treadle pumps and other manual pumps like hydraulic rams and sprinkler irrigation, including conventional systems and drag-hose and micro-irrigation systems such as pitchers, porous clay pipes, micro-sprinklers, bubblers and drips (FAO, 1997).

In general irrigation schemes in Zimbabwe use imported electric pumps (submersible or non-submersible) to pump water to the field edge and distribute by sprinklers or canals. Some use gravity supply or are supplied by locally manufactured electric pumps. Most of the irrigated area (over 80 per cent) is under overhead (sprinkler) irrigation with the remainder under surface irrigation. These two systems have efficiencies of 60 to 65 per cent and 25 to 30 per cent respectively (Manzungu, 2003). Manzungu (2003) notes that an estimated

250 to 300 centre pivots were brought into the country before 2000 and a large investment made in drip systems by both large commercial farmers, estates and plantations as well as small nutrition gardens funded by non-governmental organizations in the smallholder sector. Most of the technology was imported during the economic structural adjustment period.

Furthermore, during the economic structural adjustment period more investments were made in greenhouses. In Mashonaland provinces and in peri-urban areas, greenhouses flourished as large-scale and urban entrepreneurs invested in horticultural activities. In most cases, flowers, tomatoes, and so on, were produced for the export markets. However, most greenhouses have been neglected by new farmers who lack the technical know-how and resources to use and maintain them. Several problems have emerged from the technologies designed for smallholders. In most cases, the operation and maintenance of infrastructure is inadequate. Many of the smallholders face delays in repairing pumps. Electricity is sometimes disconnected due to non-payment of the bills or due to load shedding by the Zimbabwe Electricity Supply Company. In some schemes the gate valves and infield hydrants leak and canals are rarely repaired on time.

Despite the development of irrigation technologies, farmers are often reluctant to adopt irrigation for a variety of social and economic reasons. The type of irrigation technology, whether sprinkler or surface, affects the labour inputs and leisure time for the farmers because of the need to constantly monitor the system. It appears that sprinkler schemes require less labour, while surface systems are relatively labour intensive. Farmers on the surface irrigation schemes are faced with a high demand for labour during irrigation leaving them with little time for other important activities such as weeding, spraying and marketing.

## **Funding irrigation activities**

Irrigation is expensive and the profitability of irrigated production is critical in justifying both short-term and long-term viability of an enterprise. Strong management is needed to enhance efficiency, recover costs and to be able to sustain the whole system. The large-scale farming sector has immensely benefited from state assistance and subsidies in the past (especially during the colonial period). Small-scale irrigation has, in contrast, historically received only erratic and insignificant support from state funding and very little from the private sector.

Development costs for small-scale irrigable schemes continued to rise due to several factors. The Department of Agricultural Research and Extension estimated that the development of a hectare required from US\$2,000 to US\$3,000 for engineering works in the 1990s. Most of these works are dependent on



boreholes which in 2004 cost about US\$6,000 to sink, excluding the pump, piping and storage reservoirs. Since Zimbabwe is faced with an acute shortage of foreign currency, this has tended to affect the costs of the raw materials that are sourced from outside the country. It is currently estimated that there is a 50–60 per cent foreign currency component for every hectare developed (Manzungu, 2003).

The cost also increased substantially due to the location of most communal, old resettlement and A1 schemes. For example, Manicaland schemes require 47kms of canals to serve a total of only 1,700 hectares. Secondly, most irrigated soils consist of sand with a high infiltration rate. This necessitates short runs, short furrows leading to dense in-field canals. The average length of these canals is 150 metres per hectare. Where these are lined, they add significantly to overall development costs. The smallholder sector is generally far from major supply centres and this increases the cost of transportation of construction material.

Given the drought and effect of land reform on farms with irrigation infrastructure, the government in 2000/01 set up an irrigation rehabilitation fund. This was administered by the former Ministry of Lands, Agriculture and Rural Resettlement through ARDA with technical assistance from the Department of Agricultural Engineering and Department of Agricultural Research and Extension. Under the programme a farmer received funds to install or rehabilitate irrigation systems. The interest rate on the irrigation rehabilitation fund was 20 per cent with a repayment period of three to five years.

## **Institutional structure**

The institutional structure for water resources management has evolved since independence with the formation of new institutions, policy reviews and enactment of amendments to the legislation. The creation of a new regulatory parastatal for the water sector, the Zimbabwe National Water Authority, represented a major turning point in the management of water resources. Within the context of the 1998 Zimbabwean Water Act, the country was divided into six 'catchments', corresponding to large river basins: Mazowe, Manyame, Sanyati, Gwayi, Save and Mzingwane. Two policy groups emerged in the water sector. The first was the 'integrated water resources management' movement, initially espoused by international agencies and adopted by government at the recommendation of academics. The second was the demand-driven, decentralized development group that focused on community water development.

Within the Ministry of Agriculture and Rural Development, the Department of Agricultural Engineering designs and constructs small and medium sized dams and irrigation projects. The Department of Agricultural Engineering also has a mandate to plan, develop, operate and maintain government funded

Highest institutional authority	Sublevel authority and executing arm	Role
Ministry of Rural Resources and Water Development	Department of Water Development	<ul style="list-style-type: none"> <li>Plans, implements and operates water projects</li> <li>Supervises the planning, implementation and operation where these functions are carried out by other organizations or individuals</li> </ul>
	District Development Fund	<ul style="list-style-type: none"> <li>Inventory of hydrological data on surface and underground water resources as well as information on availability and quality of water and pollution monitoring and control</li> <li>Digging of boreholes on new farms, in old resettlement areas and communal areas</li> <li>Development of schemes of less than 20 hectares</li> </ul>
	Zimbabwe National Water Authority	<ul style="list-style-type: none"> <li>Formed by an Act of Parliament in 1998 to oversee water resources management</li> <li>It facilitates the planning and use by catchment councils</li> <li>Participates through construction of dams, pipelines and water treatment works, canals and irrigation systems</li> </ul>
	Rural Development Fund	<ul style="list-style-type: none"> <li>Development of irrigation schemes of less than five hectares</li> </ul>
Ministry of Agriculture and Rural Develop.	Depts of Agric. Research & Extension and Agric. Engineering	<ul style="list-style-type: none"> <li>Undertakes soil surveys and testing</li> <li>Provides extension to farmers</li> <li>Assists smallholder farmers with market information</li> </ul>
	Agricultural and Rural Development Authority (ARDA)	<ul style="list-style-type: none"> <li>Irrigation development for large-scale, state-funded irrigation schemes.</li> <li>Also operates its own irrigation schemes and administers settler schemes that are attached to it</li> <li>Disburses government funds to selected beneficiaries</li> </ul>
Ministry of Legal, Justice and Parliamentary affairs	Administrative court	<ul style="list-style-type: none"> <li>Court of appeal for conflicts over water issues</li> </ul>
	Other courts (high court, magistrates)	<ul style="list-style-type: none"> <li>Deals with conflicts over theft of irrigation equipment</li> </ul>
Ministry of Energy	Rural electrification agency	<ul style="list-style-type: none"> <li>Provides electricity infrastructure in the rural areas</li> </ul>
Ministry of Local Government and National Housing	District admin. (chiefs and headmen, councillors)	<ul style="list-style-type: none"> <li>Provides leadership in the irrigation schemes</li> <li>Oversees the social development of farms under irrigation</li> </ul>
Non-state actors	Water users' associations	<ul style="list-style-type: none"> <li>Any user of water</li> <li>River boards that act as the authority for particular rivers (includes farmers and non-farming communities)</li> </ul>
	Irrigation management committees	<ul style="list-style-type: none"> <li>Monitor that farmers perform their tasks adhering to bylaws agreed among themselves.</li> <li>Coordinate activities within the irrigation scheme as well as liaising with water supply authorities on water allocation and usage</li> </ul>

and managed formal, small-scale irrigation schemes as well as plan and develop government-funded, farmer-managed irrigation schemes. The department works in close liaison with irrigation management committees at the scheme level in all aspects of water use, irrigation scheduling and efficient water use practices. This arrangement has brought confusion into the management of water resources and resulted in duplication of efforts in ministries, departments and parastatals. Irrigation rehabilitation support is led by the Ministry of Agriculture and Rural Development through its departments (Agricultural Engineering, and Agricultural Research and Extension) with key parastatals (ARDA and Zimbabwe National Water Authority) playing a role. Yet the Ministry of Rural Resources and the District Development Fund have a mandate on irrigation development.

ARDA is the largest single irrigator in the country and is also involved in rehabilitating some of the infrastructure that was vandalized during the land reform programme. In addition, some of the new farms with irrigation infrastructure gazetted by government from 2004 have been allocated to ARDA (Kondozi acquisition, 2004). This has largely been done with the expectation that it would develop outgrower schemes as part of its core business of farming. Farmers would not only benefit from extension systems offered through this arrangement but would also be able to access the authority's tillage units. This has yet to yield the expected results.

The District Development Fund is the channel for funding most district-level investment expenditures. A District Development Fund office is established in each district and is responsible for developing and managing public works such as boreholes, small dams and water points, primarily in the communal and resettlement areas. Although the fund generates revenue through contract hiring out of its plant and equipment, it relies on government grants through treasury. The fund's involvement in the past in rapid installation of boreholes and provision of pump minders down to the ward level often required a crucial maintenance role. The creation of community-based management has meant that the fund operations are redundant, yet in practice the new systems are not fully operational as their institutionalization has been weak. As problems of access to water for smallholders continue, there is a need to involve community-level authorities in water resource governance. The village and ward assemblies will need to be capacitated to assess needs and articulate the demands by smallholders.

Ensuring representation of the poor at village assemblies and the nature of this participation is important. At this level the institutional dissonance between the roles and responsibilities of the key local players such as the district administrator and the chief executive officer of the rural district council will prove significant. There is potential for confusion and possibly conflict over the direction of district-level development of water supplies.

The establishment of catchment councils in Zimbabwe was an attempt to operationalize the integrated water resources management movement, under which the users of water (the units of demand) are brought within a management unit defined hydrologically on the basis of catchment boundaries. This process has been donor-led (in particular by German Technical Services, Zimbabwe, with Department for International Development and the Swedish International Development Agency) and has suffered as a result from the different pace of change initiated by each donor. Some catchment councils are up and running whilst others have barely been established which has affected the operation of the Zimbabwe National Water Authority whose board comprises representatives of the catchment councils.

Users of agricultural water are either organized into water users' associations or are simply individuals who do not belong to any association at all. In the large-scale commercial areas and the ARDA subsector, water users' associations take the form of river boards while the smallholder subsector has irrigation management committees. According to the national objectives and policies for the agricultural sector, embodied in Zimbabwe's Agricultural Policy Framework 1995-2000, the role of the irrigation management committees was to be strengthened by law. The communal and resettlement farmers were to be represented in catchment councils so they would be an integral part of the decision-making process on water resources development and management at that level. But as Sithole (2001) found out with respect to Mazowe, this has not been an easy process because of the numerous conflicts between different types of water users due to ignorance and political hostilities. Derman and Ferguson (1999) described the Mazowe group that pushed for the operationalization of the catchment council as class-based and dominated by members with commercial interests.

Catchment councils also provided an institutional vehicle for the new water rights regime under which the old idea of prior rights was replaced. They still represent a potential threat and source of future conflict over water rights. The establishment of the six catchment councils raised thorny questions about future development roles, including their relationship to other political and administrative units (particularly the rural district councils). In addition, given the presence of highly politicized local leaders under the current political climate, their capacity to function successfully whilst representing a range of water use interests is questionable. Their financial viability (and, by extension, that of the Zimbabwe National Water Authority) is contingent on the main water users and therefore levy payers who were mainly commercial farmers. But these have now been largely replaced by new A1 and A2 farmers who have little resources for irrigation purposes. This has implications for the functioning and financing of catchment councils and the Zimbabwe National Water Authority itself.

There is no doubt that political power has shifted to the rural poor who have become the new power élites based on the politics of the land reform programme. However most of these new power élites do not yet know how to exercise their power (Sithole, 2001). In reality they remain powerless because they do not have the skills and competence to access and use water storage with which they could negotiate.<sup>137</sup> Consequently, it proves that political backing alone does not necessarily ensure real power to benefit from a resource. The greatest power will be derived from the efficient use of water resources and the investments and proceeds that individuals are able to make.

The water reform process was crafted to incorporate declining government capacity to fund water development by shifting to a complex strategy of stakeholder participation, users paying and increasing access to water. The water reform strategy was premised on the continued vibrance of commercial farming with the expectation that new black commercial farmers would be entering the sector. The situation has now changed and there is need to address the policy and legal frameworks that are in operation, to make changes where necessary and to amend sections that are no longer relevant.

## **Policy and legal framework**

The relationship between droughts, floods, location of water users and institutional support is more fundamental than just access to water. This suggests that a substantial shift in land use from commercial to smallholder farming in which irrigation plays a critical role will be affected significantly by the policy regimes in place. In an effort to evolve a policy framework for water resources management, the government repealed the Water Act (1976) and replaced it with the Water Act (1998) (table 11.7). The reason for opting for these changes was uncoordinated sectoral planning and development in the sector in the past. The changes were made to ensure equitable water distribution to all Zimbabweans. The state was keen to improve the management of water resources and strengthen environmental protection. In a context of cost recovery, decentralization was seen as a strategy for promoting stakeholder participation and at the same time absolving the state from costs involved in the actual management of water use.

Table 11.7 highlights the major changes that were brought in by the Water Act (1998) and relates them to agricultural water demand management. In general there was continuity from the past policy as Zimbabwe's waters were categorized into commercial and primary use. The distinction reflected the dual legal system based on imported Roman Dutch law and British common law

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<sup>137</sup> Sithole (2001) contends that participation as seen in Zimbabwe is not defined by active involvement in the exchange of ideas but by presence in a room.

applied to the white settlers while relationships between black Zimbabweans were regulated by customary law (Tshuma, 1997). In the Water Act of 1998, primary water is defined as water used for domestic human needs in or about the area of residential premises, for animal life, to make bricks for private use and for dip tanks (Water Act 1998 section 32,1). Commercial water is similarly defined by the uses to which it is put. These include, among others, agriculture, mining, large-scale livestock, hydroelectric power, and so on. Water used for

**Table 11.7 Legislative changes in the Water Act (1998)**

<b>Key area</b>	<b>Actions</b>	<b>Implications</b>
Access to water	Vestation of all water in the president	Removes the concept of private water
Perpetual water rights based on land ownership	Introduction of water permits	Permits were valid for a specified period and are subject to review as circumstances dictate
Type of water	Removal of ground and surface water differentiation	Holistic management of all water
Preferential treatment of riparian users	Removal of priority based on geography	Equitable access to water regardless of distance from source
Catchment councils	<ul style="list-style-type: none"> <li>• Councils were set up to manage water in their respective catchment areas (river systems)</li> <li>• Representation of all water users including communal and resettlement farmers</li> </ul>	<ul style="list-style-type: none"> <li>• Councils to issue water permits, thus decentralizing and removing this function from the administrative court,</li> <li>• Administrative court to be an appeal court in certain circumstances</li> </ul>
Zimbabwe National Water Authority	A state parastatal intended to perform some of the functions	Manage all water resources and facilitate activities
User fees	<ul style="list-style-type: none"> <li>• Introducing fees for the applications of permits for commercial use of water</li> <li>• Charging for permission to discharge effluent into streams or water bodies</li> <li>• Imposing economic penalties for contravening the provisions of the Act.</li> </ul>	<ul style="list-style-type: none"> <li>• Funds collected used for the development of water resources</li> <li>• Water quality control purposes</li> </ul>

commercial purposes must be accessed with a permit while that for primary use does not need a permit. Obtaining a permit legitimizes the use of Zimbabwe's waters for commercial purposes, no matter what these might be – including urban water works. The Zimbabwe National Water Authority, in turn, is supposed to authorize and account for the water that it uses since it is a major water user itself.

In terms of participation in the policy-making process, the reform of the water sector was a positive development though there are questions about the practicality of some of the provisions on the ground. There were also questions with regard to the dynamism of the sectoral reform in view of policy changes such as the massive transfer of land to small farmers. The water reform institutions and process encouraged cooperation across the different sectors of Zimbabwean society, including different forms of land tenure (communal, large-scale and small-scale farming) and divergent economic activities (mining, industrial and agriculture) (Derman and Gonese, 2003). Unlike land, water was to be managed by stakeholder groups that comprised black and white farmers, as well as other resource users of varying scale (large, medium and small). Catchment and subcatchment councils continued to function throughout the land occupations on large commercial farms and the fast track land reform programme. This was despite the differences that emerged when farms with irrigation resources were compulsorily acquired and, in some cases, subdivided during the programme.

## **Looking ahead**

Irrigation development in Zimbabwe emerged from a strong linkage between the public and private sector stretching over many years before independence. The state undertook major projects some of which were then turned over to the private sector for more efficient use. During the UDI years, there was also import substitution that laid the groundwork for the current irrigation industry. Zimbabwe is one of the few African countries where the irrigation manufacturing industry has blossomed. The country produces its own cement and other irrigation components such as pipes and pumps. There is a need to maintain this public–private sector partnership.

The withdrawal of donor support has had a negative effect on the development of smallholder irrigation. Donors have funded numerous irrigation projects throughout the country, and in particular in the communal areas, for food security and on philanthropic grounds such as providing herbs to boost the immune system in view of the HIV and AIDS pandemic. Once international relations between government and donors are mended, efforts should be made to ensure the mobilization of donor resources for small-scale irrigation projects. Support to the A1 farmers who have not generally benefited from land with irrigation

potential should be prioritized. However, in doing so water and land tenure should be synchronized both in policy and law. The presidential land review (Utete, 2003) noted numerous conflicts over access to water as a result of the land reform.

Given the land transfers that have taken place, there is need to remap the hydrological system and its potential throughout the country to allow for replanning the irrigation systems based on trade-offs between water uses, its quality, number of users and ability to meet costs of water. There is need for dynamic policy making in view of the new agrarian structure where A1 and A2 farmers are featured as the core sector of agricultural production. Already many of the sectors (finance, commerce, manufacturing, and so on) are reorienting to service the new farmers. However, it is crucial that government demonstrates that communal and old resettlement schemes are also critical in the development of irrigation. Policy review work should define a vision of the irrigation policy framework that is relevant and involves all stakeholders. Some of the objectives and strategies that need to be considered have been elucidated by Manzungu (2003) as entailing the establishment of a water pricing structure consistent with cost and social efficiency. There is need for the country to continue rebuilding the institutional framework started in 1998 with the Water Act. A proper and efficient system of managing water resources will help mitigate the impact of both droughts and floods which continue to afflict the country.

The fast track land reform programme has yielded more settlements and beneficiaries under A1 and A2 than any other models. There is no doubt that it will take longer for A1 farmers to either continue or to initiate irrigation using the existing or new infrastructure. Their immediate needs are for water for primary uses (drinking, cleaning, livestock and small gardens). Given that the water infrastructure on the former commercial farms was designed for the production and needs of commercial farmers and their workers, there might be a need to expand the capacity to supply the new farmers and their workers. The A2 settlement model seems to be designed with possibilities for commercial use of water. While there is great variation in the size of A2 plots and how farms have been divided, there remains the potential that former irrigation could continue or that new systems could be put into production. There are already many A2 farms without primary water supplies yet the resources to support them are relatively small vis-à-vis demand. Since it is no longer an option for Zimbabwe to rely on rainfall to fulfil its food security needs, government needs to implement strategies to ensure effective generation and use of water within this new environment.



## Conclusion

There is need to improve the policy environment for water resource use and management. The cooperative spirit that has emerged in the few areas with functional catchment councils demonstrates that joint responsibility can lead to a workable framework for irrigation development. The government should continue to facilitate and create the enabling environment for such development to take place. It should take into account the special circumstances of the smallholder and the emergent farmer in their access to and use of water. In the absence of focused financial support, smallholder irrigation is unlikely to be a major source of agricultural production in the near future. Irrigation has played a pivotal role in crop diversification strategies of commercial farmers and, more recently, farmers have diversified from cereals to horticulture as this sector has become more lucrative.

The impact of irrigation in A1 and communal areas has, on the other hand, been minimal. Historically the government subsidized smallholder irrigation with the aim of improving food security in the drought-prone areas and to settle displaced farmers. Most of these projects were distant from markets, faced water shortages and continued to operate through a government subsidy. But the potential for irrigation is greater in the A2 and large-scale commercial areas which are strategically located in the rich river systems and catchment areas. The experience with the irrigation rehabilitation fund suggests that irrigation will mainly expand on A2 schemes, estates and plantations, on ARDA lands and on the remaining large-scale commercial farms to the detriment of communal areas. The Water Act (1998) made some significant changes in the management of water resources. New systems of stakeholder participation which include smallholder farmers who were previously marginalized, may revolutionize the water sector through the establishment of catchment and subcatchment councils.

## References

Chitsiko, R. J. 'Smallholder irrigation and poultry development in Zimbabwe', a paper prepared for the Food and Agriculture Organization of the United Nations, Rome, 1997.

Spore, 'Whose hand is on the wheel?', Centre for Technical Cooperation Netherlands (CTA magazine), No. 90, 2000.

Derman, B. and F. Gonese, 'Water reform in Zimbabwe: its multiple interfaces with the land reform and resettlement', in M. Roth and F. Gonese (eds), *Delivering land and securing rural livelihoods: post-independence land reform and resettlement in Zimbabwe*, Centre for Applied Social Sciences, University of Zimbabwe and Land Tenure Centre, Wisconsin, 2003.

Derman, B. and A. Ferguson, 'Against the flow: Activism and advocacy in the reform of Zimbabwe's water sector', in *Culture and Agriculture* 21, No. 32 1999.

Food and Agriculture Organization (FAO), *Irrigation subsector review and development strategy*, Harare, 1990.

– 'Summary of findings of missions in selected countries in east and southern Africa in irrigation technology transfer in support of food security', proceedings of a Food and Agriculture Organization subregional workshop, Harare, Zimbabwe, 14–17 April 1997.

International Fund for Agricultural Development (IFAD), 'Smallholder irrigation support programme: Formulation report', Harare, 1997.

Magadzire, G. S. T., 'Water development and diversification within the smallholder sector: ZFU perspective', Zimbabwe Farmers' Union, Harare, 1995.

Makadho, J. and M. Rukuni, 'Irrigation development', in M. Rukuni and C. Eicher (eds), *Zimbabwe's agricultural revolution*, University of Zimbabwe Publications, Harare, 1994.

Manzungu, E., 'Towards sustainable water resources and irrigation development in the post fast track land reform era in Zimbabwe', in C. M. B. Utete (chairman), *Presidential Land Review Committee, Vol. II, Technical report*, Government of Zimbabwe, Harare, 2003.

Matiza-Chiuta, T., 'Shared water resources and conflicts: The case of the Zambezi river basin', in D. Tevera and S. Moyo (eds), *Environmental security in southern Africa*, Sapes Books, Harare, 2000.

Matondi, P. B., 'The struggle for access to land and water resources in Zimbabwe: The case of Shamva', PhD thesis, Swedish University of Agricultural Sciences, Uppsala, 2001.

Munyuki-Hungwe, M., 'A comparative analysis of government and community managed systems on smallholder irrigation schemes – the case of Ngezi Mamina and Chitora irrigation schemes', unpublished Masters of Policy paper, University of Zimbabwe, Harare, 2001.

Rukuni, M., 'An analysis of economic and institutional factors affecting irrigation development in communal lands of Zimbabwe', unpublished DPhil thesis, Department of Land Management, University of Zimbabwe, Harare, 1984.

– 'From participation to farmer management of irrigation systems', paper presented at regional workshop on 'Farmer participation in irrigation management – experiences from eastern and southern Africa', 11–15 December, Harare, 1995.

Senzanje, A., 'Irrigation management transfer: Worldwide experiences, lessons for Zimbabwe', Working paper, Department of Soil Science and Agricultural Engineering, University of Zimbabwe, Harare, 2000.

Sithole, B., 'Use of and access to *dambos* in communal lands in Zimbabwe: Institutional considerations', Centre for Applied Social Sciences, University of Zimbabwe, Harare, 1999.

– ‘Participation and stakeholder dynamics in the water reform process in Zimbabwe: The case of the Mazowe pilot catchment board’, in *African Studies Quarterly* 5, No.3 (Fall), 2001.

Tshuma, L., *A matter of (in)justice: the state, law and agrarian questions in Zimbabwe*, Sapes Books, Harare, 1997.

Utete, C. M. B., *Presidential Land Review Committee, Vol. 1, main report*, Government of Zimbabwe, Harare, 2003.

Whitlow, R., ‘Dambos in Zimbabwe: A review’, in *Zeitschrift for Geomorphologie Supplement band*, Vol. 52:63–86, 1984.



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