Zambia

GEOGRAPHY, CLIMATE AND POPULATION

The landlocked Republic of Zambia covers 752 610 km² between the latitudes 8°15' and 18°7' South of the equator and the longitudes 22° to 34° East of the Greenwich Meridian. The cultivable area is estimated at 16.35 million ha. Almost 5.3 million hectares, or 7 percent of the total area and 32 percent of the cultivable area, are cultivated including sugar cane, coffee and bananas (Table 1). About 100 000 ha of dambos or inland valley bottoms (wetlands) are utilized for crop production by small-scale farmers.

The Zambezi valley and Luangwa valley escarpments are mountainous and rocky, while the rest of the country is by and large a level to gently undulating plateau with slopes rarely exceeding 3 to 5 percent. Interfluves mostly comprise deep weathered soils, which occupy large tracts of land in the main drainage systems consisting of the Zambezi, Luangwa, Luapula/Chambeshi and Kafue rivers. Major soil types include the black clays (vertisols) and sandy clays commonly found in the Kafue basin and the

TABLE 1
Basic statistics and population

Physical areas			
Area of the country	2002	75 261 000	ha
Cultivated area (arable land and area under permanent crops)	2002	5 289 000	ha
• as % of the total area of the country	2002	7	%
• arable land (annual crops + temp. fallow + temp. meadows)	2002	5 260 000	ha
• area under permanent crops	2002	29 000	ha
Population			
Total population	2004	10 924 000	inhabitants
• of which rural	2004	64	%
Population density	2004	15	inhabitants/km²
Economically active population	2004	4 597 000	inhabitants
• as % of total population	2004	42	%
• female	2004	44	%
• male	2004	56	%
Population economically active in agriculture	2004	3 078 000	inhabitants
• as % of total economically active population	2004	67	%
• female	2004	48	%
• male	2004	52	%
Economy and development			
Gross Domestic Product (GDP) (current US$)	2003	4 300	million US$/yr
• value added in agriculture (% of GDP)	2003	19.3	%
• GDP per capita	2003	398	US$/yr
Human Development Index (highest = 1)	2002	0.389	
Access to improved drinking water sources			
Total population	2002	55	%
Urban population	2002	90	%
Rural population	2002	36	%

dambo areas. Red clays, sand veldt and clay loam soils are common in plateau areas. These soils are generally of moderate fertility status with no salinity problems.

Although lying within the Tropics, because of the high altitude much of Zambia enjoys a subtropical climate, which is characterized by two seasons:

- The cool and hot dry season from May to October. During this season rainfall is absolutely absent and full-serve irrigation and wetland utilization becomes important. Mean temperatures vary from 16 °C to 21 °C. This season is split into a 'dry cool period' from May to July, called midwinter season, that exhibits low temperatures averaging up to 16 °C and a 'dry hot period' with mean temperatures of 24 °C. Maximum daily temperatures of 30 °C to 40 °C are not uncommon particularly for low-lying valley areas such as the Zambezi, Gwembe and Luangwa valleys. For this reason, these areas offer high potential for winter-maize production under irrigation. Frost is usually registered in some parts of the country during the dry cool period.
- The wet season between November and April is in every respect characterized by rainfall. December and January/February are the wettest months. Mean temperatures during this season are around 21 °C.

Rainfall is unimodal and is mainly influenced by the Inter-Tropical Convergence Zone (ITCZ) with variations due to altitude, latitude, temperature, relative humidity and control of air masses. The ITCZ is essentially a low air-pressure zone or belt that attracts the moist northeasterly/westerly winds, which in effect bring rainfall to the area. This low-pressure zone mostly lies over the Democratic Republic of the Congo and the northern parts of Zambia for a long period during summer, bringing about the rainy season between the months of November and April.

Mean annual rainfall is 1 020 mm. In the south it is lowest, at 750 mm, while the central parts of the country get between 900 and 1 200 mm and the north about 1 400 mm. The country has been divided into agro-ecological zones I, II and III, representing the south, central and northern parts of Zambia respectively and are characterized by this rainfall distribution. Rainfall totals and intra-seasonal distribution vary greatly from year to year, particularly in the south. This makes rainfed agriculture, which is easily affected by droughts, highly undependable. Paradoxically agro-ecological zone III with excessive high rainfall has acidic soils due to leaching, limiting crop production.

Zambia's population is about 10.9 million (2004), of which 64 percent is rural (Table 1). The annual population growth rate is about 1.5 percent, showing a considerable reduction compared to the 3.1 percent registered for the period 1980-1990. This reduction is attributed to reduced fertility and increased mortality levels. The population density stands at 15 inhabitants/km^2. Water supply coverage shows that 36 percent of the rural population and 90 percent of the urban population respectively were using improved drinking water sources in 2000 (Table 1). More than 80 percent of the population is believed to be below the poverty datum line. Although the unemployment level of 18.2 percent has decreased to 9.5 percent, it has not reduced poverty primarily due to insufficient wages from informal sector jobs. Generally incomes are too low to meet livelihood demands adequately.

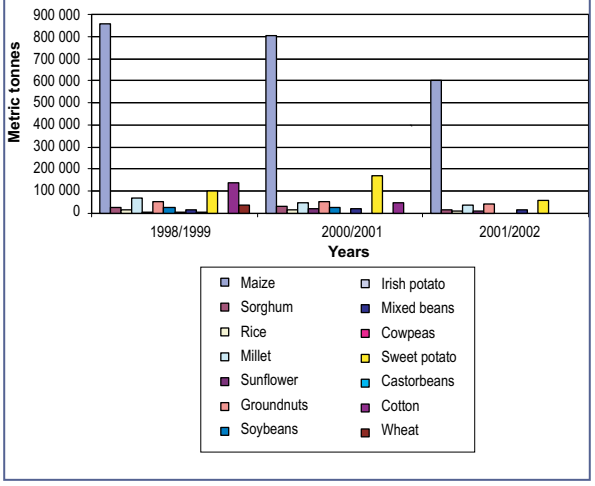
ECONOMY, AGRICULTURE AND FOOD SECURITY

The country's GDP was US$4.3 billion in 2002 showing an annual growth of 3 percent. The inflation rate of 26.7 percent poses a lot of hardships especially for the poor people. Agriculture's contribution to GDP is usually affected by characteristic droughts and was 19.3 percent in 2003. The sector has been given top priority, in particular because mining activities have sharply declined and some mines have been closed. The agricultural export potential is enormous considering that it increased from US$46.5 million in 1995 to US$133.9 million in 1999. Out-grower schemes

have led to accelerated crop diversification and subsequent commercialization. Eighty percent of the population is dependent on agriculture, which provides employment for about 70 percent of the labour force.

In rainfed farming, four farmer categories are distinguished based on land size owned by a respective farmer: i) small-scale farmers owning 0.5-10 ha; ii) emergent farmers owning 10-20 ha; iii) medium-scale farmers owning 20-60 ha; iv) large-scale, or commercial, farmers own more than 60 ha. Small-scale farmers are food crop oriented whereas large-scale farmers primarily produce cash crops. The emergent farmers produce a mix of food and cash crops. There are about 600 000 small-scale farmers of which 119 200 are emergent farmers. The number of medium-scale farmers is 100 000 countrywide whilst there are 1 500 large-scale farmers.

FIGURE 1
Crop production in Zambia



Drought occurrences continue to depress food production and thus food insecurity threatens 80 percent of the population. The Lusaka province, for example, registered a reduced maize production from 85 715 tonnes in 1993 to a meager 19 329 tonnes in 1995, whereas paddy rice showed systematic reduction from about 600 tonnes in 1991 to less than 5 tonnes in 1996 and cereal wheat from 20 251 to 11 504 tonnes in the same period. Similar trends of crop production were registered in other provinces and overall at the national level. Reduced crop production has been attributed to the heavy dependency on rainfed agriculture, which is unreliable due to severe droughts, and thus food deficits, particularly maize, frequently occur. Figure 1 shows the production over a recent period.

According to the Poverty Reduction Strategy Paper (PRSP), agriculture is the main source of income and employment for rural women who constitute more than half of the total rural population. From that it may be concluded that an increase in rural income will result in overall poverty reduction and increased food security; in order to achieve the latter, the country's main focus is on agriculture and particularly on irrigation development.

WATER RESOURCES AND USE

Water resources

Zambia lies entirely within two large river basins, the Zambezi River basin and the Congo River basins. Below are three major river systems within the Zambezi River basin and two within the Congo River basin:

- The upper main Zambezi River system is joined by the Luangwa and Kafue tributaries in Zambia. The upper Zambezi originates in Angola and flows to Mozambique after forming the border with Zimbabwe.
- The Kafue River system covers an area of 152 000 km^2. The river has two important dams, the Itezhi-Tezhi dam and the Kafue Gorge dam, the latter of which is used for hydropower generation.
- The Luangwa River has a catchment area of 165 000 km^2. It drains most of the central parts of the country and empties into the Zambezi.
- The Chambeshi River and the Luapula River are associated with lakes Mweru and Mweru-Wantipa and drain their water into the Congo River system.
- The small Tanganyika drainage system is also part of the large Congo River system.

TABLE 2
Water: sources and use

Renewable water resources			
Average precipitation		1 020	mm/yr
		767.7	10^9 m³/yr
Internal renewable water resources		80.2	10^9 m³/yr
Total actual renewable water resources		105.2	10^9 m³/yr
Dependency ratio		23.8	%
Total actual renewable water resources per inhabitant	2004	9 630	m³/yr
Total dam capacity *	2002	106 000	10^6 m³
Water withdrawal			
Total water withdrawal	2000	1 737	10^6 m³/yr
- agricultural	2000	1 320	10^6 m³/yr
- domestic	2000	286	10^6 m³/yr
- industrial	2000	131	10^6 m³/yr
• per inhabitant	2000	167	m³/yr
• as % of total actual renewable water resources	2000	1.7	%
Non-conventional sources of water			
Produced wastewater		-	10^6 m³/yr
Treated wastewater		-	10^6 m³/yr
Reused treated wastewater		-	10^6 m³/yr
Desalinated water produced		-	10^6 m³/yr
R-used agricultural drainage water		-	10^6 m³/yr

*The total capacity of the Kariba Dam on the Zambezi River bordering Zambia and Zimbabwe is 188 km³.
In each country 50% of the Kariba Dam capacity will be included, which is 94 km³.
This gives a total dam capacity for Zambia of 94 + 12 (other dams) = 106 km³.

The total renewable water resources of Zambia amount to about 105 km³/year, of which about 80 km³/year are produced internally (Table 2). An extensive area of 25 000 km² is covered with Limestone aquifer layers extending from Lusaka to the northwest.

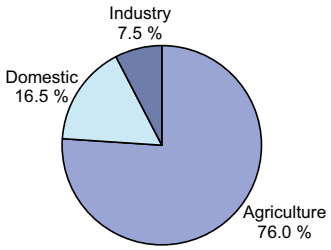
There are about 1 700 dams. The total capacity is about 106 km³, but this includes 50 percent of Lake Kariba on the Zambezi River, which is shared between Zambia and Zimbabwe and which accounts for 94 km³ of this capacity. Not taking into consideration this shared dam, the total capacity is thus about 12 km³. However, this figure probably also includes small dams with a height of less than 15 metres. Information related to dams at the Water Board is fragmented; although the Board in 1994 initiated a study to compile a dam inventory for the country, this is not available yet. In drought prone areas of the Eastern, Lusaka, Central and Southern provinces, water needs to be conserved for livestock, agriculture and domestic use. This has led to the construction of low-cost earth dams and water impoundment earth bunds, spearheaded by the farmers themselves or the government for drought relief since 1991. The number of such structures is estimated to be between 2 000 and 3 000. However, most of them are in a state of disrepair either because of breaching, lack of or insufficient maintenance or poor design.

Zambia has an installed hydropower capacity of 1 670 MW. The present capacity of the Kafue Gorge dam mentioned above is 900 MW, while the Lake Kariba dam contributes about 600 MW and the Victoria Falls 108 MW. The hydropower stations Northeastern and ZCCM hydropower have capacities of 24 MW and 38 MW respectively.

Wetlands, including dambos, which cover about 3.6 million hectares or 4.8 percent of the total land area, are a source of livelihood for the majority of small-scale farmers in Zambia. Dambos are used for grazing animals in the dry season when upland vegetation is dry and with little nutritive value. They are also important for fishing, livestock-watering, hunting of small animals, collection of thatching grass and most importantly, for dry season vegetable growing. Seepage zones and shallow wells are

used as sources of water. Sometimes water storage needs for irrigation may dictate the construction of a low-cost earth dam. This type of use at small-scale does not entail the use of heavy machinery for cultivation or draining water.

FIGURE 2
Water withdrawal
Total: 1.737 km³ in 2000



Water use

Total water withdrawal was 1.737 km³ in 2000, with agricultural water use accounting for 1.320 km³ (77 percent), or more than three-quarters of the total domestic water use claiming 0.286 km³ and dwindling industries taking 0.131 km³ (Table 2 and Figure 2). Future water use is estimated to reach 1.922 km³/year by 2012, assuming that land under irrigation will continue to expand at the rate of 1 200-1 500 ha/yr, industrial use will increase by 10 percent and the population will increase at a moderate rate.

International water issues

Zambia has had no conflicts over its internationally shared waters so far. International agreements on shared management of the Zambezi River and of Lake Tanganyika/ Congo River basin are covered within the Southern African Development Community (SADC) protocol on shared watercourse systems that was signed by all heads of the 14 SADC member states. The international protocol applies to all countries with shared watercourse systems and no separate agreements are made if the watercourse system is just shared between two countries.

IRRIGATION AND DRAINAGE DEVELOPMENT

Evolution of irrigation development

Zambia's irrigation potential is 2.75 million ha based on water availability and soil irrigability. From this potential, it is believed that 523 000 ha can be economically developed. However, the fact that different but not documented figures of the potential are quoted by other authors indicates the need for a systematic assessment to determine the correctness of the findings.

The following categories of irrigated farming are found in the country:

- Informal irrigation by small-scale farmers;
- Smallholder irrigation schemes;
- Former quasi-government schemes;
- Private or commercial irrigation schemes.

Since time immemorial, small-scale farmers all over the country have practised informal irrigation in their gardens, i.e. they applied water in an undocumented, casual, artificial way using buckets, watering cans and hosepipes to grow vegetables, rice, bananas and some local sugar cane varieties along streams, rivers and in dambos. This form of irrigation is usually not capital intensive, is farmer-operated and is often spontaneous in origin, responding to the needs felt by individual farmers. Drought occurrences, for example, directly prompt the genesis of such irrigation developments. Areas irrigated in this manner are usually small in size ranging from 100 - 200 m². However, the introduction of treadle pumps has improved the efficiency of watering these gardens and farmers are now able to irrigate with one treadle pump areas ranging from 1 000 - 2 500 m².

In the late 1960s to early 1970s, the Government developed and managed smallholder irrigation schemes through the then Projects Division of the then Ministry of Rural Development. These schemes included:

- the Buleya Malima (62 ha furrow irrigation), Nkadabwe (12 ha), Chiyabi (12 ha) and Siatwiinda (12 ha) schemes in the Gwembe valley;
- the Chapula (272 ha) horticultural scheme in the Copperbelt;
- the Luapula and Eastern provinces vegetable schemes;
- the Ikelenge pineapple scheme in Northwestern province;
- the Mulumbi and Lukulu North (6 000 ha) projects in Mansa and Kasama.

The primary objectives for the construction of such irrigation schemes were:

- Compensation for the land that local farmers lost, since they were displaced because of national projects such as the construction of the Lake Kariba dam in the Gwembe valley;
- Production of crops that would meet local community requirements, particularly for hunger relief during drought periods;
- Introduction and promotion of irrigated agriculture.

Most of these irrigation schemes have not performed well due to a top-down management approach, which did not empower farmers to operate and maintain them by themselves. Some of these irrigation schemes are in a collapsed state while others were not completed at construction stage. The Government's current policy is to rehabilitate or complete construction of these schemes and then transfer the management responsibility for operation and maintenance of the systems to its beneficiaries.

Other irrigation schemes that followed the ones described above are parastatal schemes, which were initiated by the Government for the sole purpose of producing specific crops for throughput to their industries. Such crops included coffee (Kateshi and Ngoli irrigation schemes), bananas (Munushi and Chiawa schemes) and tea (Kawambwa scheme). These schemes range from medium- to large-scale irrigation schemes and include the Nakambala Sugar Estate developed by Tate and Lyle, which is now managed by the Illovo sugar group, a South African company.

The irrigation farms of the private and commercial sector cover some 37 015 ha in the large-scale irrigation schemes category. These have been developed purely on economic lines and grow high-value commercial crops for export and local consumption. One single large scheme of its kind in this category is Nakambala Sugar Estate plc, which covers 11 349 ha. It has an out-grower scheme which includes the Kaleya smallholder scheme (2 383 ha), Garner (440 ha), Ceres (545 ha), Kapinga (81 ha), Syringa (80 ha), Mapula (235 ha), Anchor (33 ha) and Nanga Farms plc (1 272 ha). All these schemes grow sugar cane, which has satisfied local demand and some is exported. Other schemes producing sugar cane on a 2 000 ha land include the Nampundwe and the Northern Province sugar estates.

Until recently the majority of Zambians shunned irrigation with a view that it entailed huge investments requiring pump sets and pipe network. However, frequent and disastrous droughts, which led to the failure of rainfed crops, forced farmers to go into some form of irrigation using available surface water resources.

Currently 155 912 ha of land are irrigated in Zambia, which is about 30 percent of the economical irrigation potential (Table 3). It can be broken down as follows according to the technology used (Figure 3):

- 32 189 ha is under surface irrigation; sugar cane covers more than 50 percent of this area;
- 17 570 ha is irrigated by sprinklers; wheat accounts for 68 percent of this area;
- Drip irrigation covers some 5 628 ha; coffee production accounts for 92 percent of this area;
- Small-scale farmers are growing vegetables in dambos over an area of 100 000 ha, which are equipped with small drains, impoundment furrows and shallow wells for irrigating a wide range of vegetables in the dry season (May-October);

- Some of the small-scale farmers use treadle pumps to irrigate areas of about 525 ha; it is estimated that more than 3 000 treadle pumps are in use.

About 100 000 ha of non-equipped lowland areas are cultivated particularly in the rainy season in the interfluves. Around 10 ha around Lake Kariba is used for flood recession cropping (Table 3 and Figure 4).

Improved water management under rainfed agriculture has been advocated to realize the best possible water supply for the crops. This has been achieved through advocacy programmes for adopting conservation farming using micro-basins of sizes of 35 cm x 15 cm x 15 cm prepared by hand hoes. When it rains, they act as water harvesting basins that store water for much longer. This method has proved to yield 3 tonnes/ha of maize compared to 1.5 tonnes/ha using conventional methods. This performance has led to an accelerated adoption of this farming system. There are currently an estimated 200 000 ha under conservation and/or water harvesting farming by small-scale farmers. Although quite rare, supplementary irrigation is mainly practised by commercial farmers on fields that are planted with rainfed soybean in rotation with irrigated wheat. A few commercial farmers supplement cotton with irrigation before the onset of the rains in November.

Zambia's irrigated areas equipped for full control irrigation can be broken down by size as follows (Figure 5):

- Small-scale and informal irrigation covers 11 000 ha (20 percent of total area) and is characterized by vegetables growing mainly on dambos and riverbanks. Shallow wells are dug and small drains where it is too wet to grow crops. Farmers use either treadle pumps or buckets tied to a rope for lifting water from these shallow wells or rivers.
- Medium-scale irrigation schemes cover 7 372 ha (13 percent) and commonly use motorized pumps (diesel or petrol).
- Large-scale commercial irrigation schemes cover 37 015 ha (67 percent) and use electrically driven pumps to lift water and irrigate large areas. Commercial crops like sugar cane, wheat and coffee are commonly irrigated in these schemes.

About 88 percent of the area equipped for full or partial control irrigation draws its water from surface water and 12 percent from groundwater (Figure 6)r.

FIGURE 3
Irrigation techniques
Total: 55 387 ha in 2002

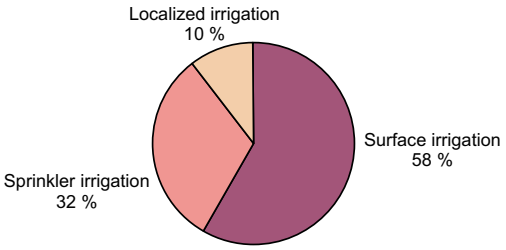


FIGURE 4
Water managed areas
Total: 255 922 ha in 2002

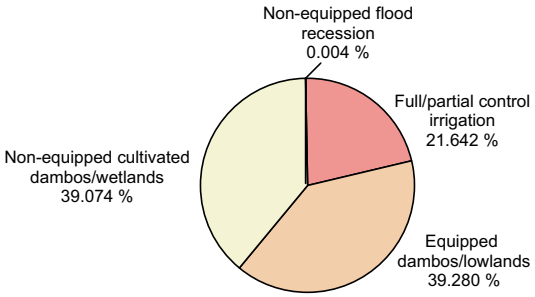


FIGURE 5
Irrigation scheme size in full/partial control irrigation schemes
Total: 55 387 ha in 2002

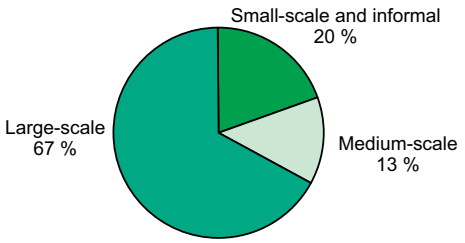


TABLE 3
Irrigation and drainage

Irrigation potential		**523 000**	**ha**
Water management			
1. Full or partial control irrigation: equipped area	2002	55 387	ha
- surface irrigation	2002	32 189	ha
- sprinkler irrigation	2002	17 570	ha
- localized irrigation	2002	5 628	ha
• % of area irrigated from groundwater	2002	12	%
• % of area irrigated from surface water	2002	88	%
2. Equipped lowlands (wetland, ivb, flood plains, mangroves)	2002	100 525	ha
3. Spate irrigation		-	ha
Total area equipped for irrigation (1+2+3)	**2002**	**155 912**	**ha**
• as % of the cultivated area	2002	3	%
• average increase per year over the last ... years		-	%
• power irrigated area as % of total area equipped	2002	25	%
• % of total area equipped actually irrigated	2002	100	%
4. Non-equipped cultivated wetlands and inland valley bottoms	2002	100 000	ha
5. Non-equipped flood recession cropping area	2002	10	ha
Total water-managed area (1+2+3+4+5)	**2002**	**255 922**	**ha**
• as % of the cultivated area	2002	5	%
Full or partial control irrigation schemes Criteria			
Small-scale schemes	2002	11 000	ha
Medium-scale schemes	2002	7 372	ha
Large-scale schemes	2002	37 015	ha
Total number of households in irrigation			
Irrigated crops in full or partial control irrigation schemes			
Total irrigated grain production		-	tonnes
• as % of total grain production		-	%
• Annual crops: total	2002	26 599	ha
- sugar cane	2002	18 418	ha
- wheat	2002	12 200	ha
- rice	2002	8 000	ha
- vegetables	2002	3 000	ha
- maize	2002	1 500	ha
- tea	2002	520	ha
- cotton	2002	35	ha
- other annual crops	2002	1 344	ha
• Permanent crops: total	2002	28 788	ha
- coffee	2002	5 160	ha
- bananas	2002	3 000	ha
- citrus	2002	2 210	ha
Irrigated cropping intensity	2002	100	%
Drainage - Environment			
Total drained area		-	ha
- part of the area equipped for irrigation drained		-	ha
- other drained area (non-irrigated)		-	ha
• drained area as % of cultivated area		-	%
Flood-protected areas		-	ha
Area salinized by irrigation		-	ha
Population affected by water-related diseases		-	inhabitants

Role of irrigation in agricultural production, the economy and society

Irrigated agriculture has been shown to yield two- to four-fold compared to rainfed agriculture. For example rainfed wheat yields between 1.5 and 2 tonnes/ha compared to the national figure of 6 tonnes/ha for irrigated wheat. Similarly rainfed maize yields 1.5 tonnes/ha using conventional methods compared to 3 tonnes/ha under conservation farming and/or water harvesting conditions and 9 tonnes/ha under irrigation. The

main irrigated crops are sugar cane, wheat and rice (Table 3 and Figure 7). Other irrigated crops include coffee, bananas, vegetables, citrus fruits, maize and tea. Cotton irrigation has virtually collapsed in the country due to commercial farmers opting for high-value irrigated crops like paprika.

Urban and peri-urban irrigation in Zambia has become increasingly important since 1992. This period coincides with the advent of the most severe drought experienced in southern Africa and the transition from a command economy to a market economy wherein all subsidies on agricultural inputs were removed and the Government's role in marketing produce completely ceased. The combination of these events led to the failure of most urban and peri-urban people to practise rainfed farming in their remote fields away from town. Furthermore, the privatization of most companies led to massive job losses in towns. To cope with the cost of living, most people started growing irrigated vegetables and fruit trees in backyard gardens and on their smallholdings. Women marketers buy the vegetables and fruits harvested from these gardens. They sell them in urban markets and along streets and shop corridors. This kind of business acts as a socio-economic safety net since it provides women with an opportunity to generate income at the household level. The producers create employment particularly for young people who work in the gardens as well as market the produce. There are, for example, approximately 2 000 ha of such irrigated gardens around Lusaka town.

FIGURE 6
Origin of irrigation water in full/partial control irrigation schemes
Total: 55 387 ha in 2002

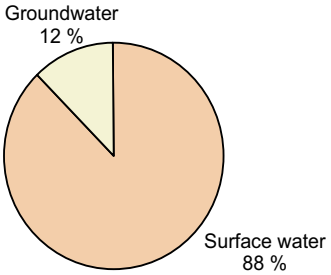
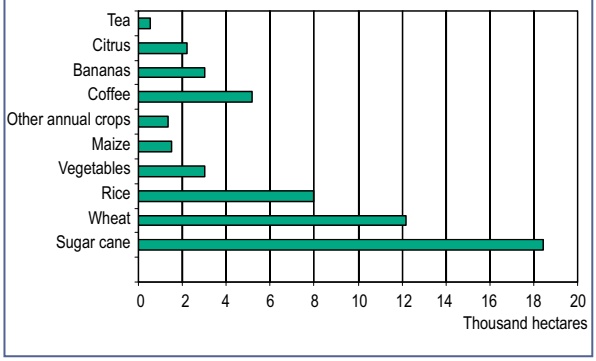


FIGURE 7
Irrigated crops
Total: 55 387 ha in 2002 (cropping intensity 100%)



In smallholder irrigation, the installation of small drains, furrows and micro-basins are activities that men are heavily involved in. Women are mainly in charge of watering the crops as well as weeding or cleaning the conveyance canals. Mainly women and youths operate the treadle pumps. In pressurized systems, men do the changing of lateral lines and operation of the pumps.

The costs of operation and maintenance of irrigation schemes have not been well documented. However, at Buleya Malima, a surface irrigation scheme using furrow and basin systems, each scheme-member irrigating 0.25 ha paid US$58/year as fee. There are 130 farmers in this scheme, which includes a 3.5 ha orchard whose proceeds go towards operation and maintenance.

WATER MANAGEMENT, POLICIES AND LEGISLATION RELATED TO WATER USE IN AGRICULTURE

Institutions

The Technical Services Branch (TSB) in the Department of Field Services of the Ministry of Agriculture and Cooperatives (MACO) is the main institution mandated to plan and develop all aspects related to irrigation and water management. The TSB consists of three sections, namely: i) Irrigation Engineering Section; ii) Land Husbandry Section; iii) Farm Power and Machinery Section. The TSB through the

Irrigation Engineering Section provides services to farming enterprises in irrigation agronomy, catchment hydrology and related hydraulic and civil engineering aspects. It also helps the Government to formulate policies for irrigation development, to carry out water resources assessments and to implement irrigation projects.

While many other government agencies and some NGOs with interest in the irrigation sector exist, the Ministry of Energy and Water Development (MEWD) is the key one. It houses the Department of Water Affairs and the Water Development Board of Zambia, both of which are mandated to deal with water resources development and management. The Water Development Board of Zambia allocates water rights although no water charges have been levied on any irrigation abstractions. All land allocations for any development purposes, including irrigation, are the responsibility of the Ministry of Lands (MOL), which is also responsible for issuing title deeds. Its current policy is to set aside at least 30 percent of the demarcated land for women and other vulnerable groups.

The private sector and NGOs play an important role in community mobilization for irrigation, with respect for traditional farmers or emerging farmers adopting irrigation.

Water management

The expertise for irrigation water management available at the field level is very poor if not non-existent among most farmers in Zambia. This situation is even worse among small-scale farmers than among medium-scale and commercial farmers. Conveyance water losses are tolerated without due regard, leading to localized flooding and inefficient water application. The situation is exacerbated by the fact that most farmers over-irrigate their crops, which also is an economic loss for the farmers because they pay more money for pumping water but get diminishing returns from their production.

The reasons for the above phenomenon are many. Firstly, there is an absence of water management regulations. Secondly, the Water Board committee has no capacity to enforce existing water rights regulations and fees and, as a result, water users, including major users like ZESCO and the Nakambala Sugar Estates, owe thousands of US dollars to the Water Board. Because of this users of irrigation water do not think of water as an economic good; only when there is a shortage do users consider water important.

Training for communities in water use and management is provided by the TSB through its provincial, district and camp officers. NGOs like CLUSA, IDE and Total Land Care also have a large focus on water management and water use capacity building among small-scale farmers. The main thrust of training offered to water users is on aspects of leadership and group organization and on technical aspects of management and maintenance of infrastructure such as canals, furrows, small dams and pumps. Such training will build the capacity of the irrigation communities to run the affairs of the schemes without external help from the Government. It will also ensure that all irrigation schemes under rehabilitation will be handed over to the farmers for operation and maintenance. As an result, scheme operators realized that they have to charge fees for pumped irrigation schemes.

Finances

Irrigation development funds are controlled at the ministerial level. The funds are thus allocated to provinces for further disbursement to districts where programmes are implemented at grass roots level. The running of any irrigation scheme is the responsibility of the community, which is involved in its operation and maintenance activities. The scheme management may charge fees for operation and maintenance on the basis of demands.

Policies and legislation

The Water Policy of 1994 recognized water as an economic good by drafting a water tariff legislation to cover the provision and allocation of water resources for consumptive and non-consumptive use. For agriculture, the policy recognizes water use for irrigation, livestock watering and aquaculture. Other uses include hydropower generation, water transport, water recreation and tourism, industrial and health. Access to land and water is open to all, although procedures for acquisition have to be followed. In recognition of the importance of the irrigation sector and its needs for a suitable legal framework, the Government is in the process of revising the Water Act to accommodate the needs of the irrigation and other water- using sectors.

Two land tenure systems, customary tenure and statutory tenure, exist according to the draft Land Policy of 2002. Customary land forms the bulk of Zambia's land (94 percent) and is under traditional chiefs and their headmen. Statutory land is under state control and comprises 6 percent of the total land.

A first Irrigation Policy is under preparation, of which the first draft is already available. In retrospect, the National Development Plan of 1989-1993 placed emphasis on the development and promotion of small-scale and large-scale irrigation programmes through developing dams, irrigation infrastructure, gravity-driven irrigation systems and economically sustainable irrigation systems for small-scale farmers, expanding the electricity grid to cater for the irrigation areas, preparing a National Water Resources Master Plan and expanding the area under irrigation.

ENVIRONMENT AND HEALTH

The current National Environmental Action Plan being implemented by the Ministry of Environment and Natural Resources (MENR) will help to improve environment-related institutional capacity within the country. The positive impacts of the present irrigation programmes include the reduction of random settlements, the intensification of production (reduces extensive agriculture), the reduction of soil erosion, the improvement of self-sufficiency in staple food and increases in household incomes and the wellbeing of smallholder families. Increased incomes will indirectly improve health conditions through better nutrition and improved water and sanitation. However, the construction and rehabilitation of informal systems may create or increase the possibility of water-borne diseases such as bilharzia. Irrigation development may also lead to increased cases of malaria.

PERSPECTIVES FOR AGRICULTURAL WATER MANAGEMENT

The primary purpose of the irrigation policy and strategy which is under preparation is to shed the dependence on the volatile production from rainfed systems and ensure food security. Beyond the satisfaction of basic needs, the prudent positioning of irrigated agriculture within Zambia's economic framework can make positive contributions to poverty alleviation and economic growth. While formal irrigation can directly enhance food security and economic growth, there is no direct link between formal irrigation and poverty alleviation. Therefore, the style and quantity of investment in irrigation has to be carefully judged. The strategy has determined four strategic paths that can be followed, each with its specific impact on the three types of player in the irrigated sub-sector: commercial farmers, emerging farmers and traditional farmers. The strategic aim is to expand the emerging farmer base in Zambia by promoting commercial irrigation enterprises building on the experience of the large-scale commercial sector. This will hinge on the correct identification of market opportunities at the local, national and regional level. Four programmatic paths have been identified in which specific sub-programmes are elaborated: i) enabling the environment (marketing, support services, capacity building, legislation); ii) alternatives to formal irrigation (water harvesting,

dambo development); iii) improving existing assets (rehabilitation and upgrading, infrastructure upgrade, irrigation management transfer); iv) promoting new investment (public/private development, new infrastructure).

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