



Mozambique

GEOGRAPHY, CLIMATE AND POPULATION

Mozambique is located on the east coast of southern Africa on the Indian Ocean, between latitudes 10°27'S and 26°52'S and longitudes 30°12'W and 40°51'W. The country is bordered by the United Republic of Tanzania in the north, South Africa in the south, Swaziland in the southwest and South Africa, Zimbabwe, Zambia in the west, and Malawi in the northwest. The country has a total area of 801 590 km², of which 2 percent are inland waters. The country is about 1 750 km long and its maximum width is about 1 100 km. The land borders have a length of 4 445 km, while the coastline measures 2 515 km.

There are three basic geographic divisions:

- A coastal belt which covers about 44 percent of the country, comprising most of the areas south of the Save River and the lower Zambezi area;
- A middle plateau, ranging from 200 – 1 000 m in elevation and covering about 29 percent of the country;
- A plateau and highland region with average elevations of around 1 000 m to the north of the Zambezi River covering about 27 percent of the country.

About 62 million ha, or 78 percent of the total area, are covered by natural vegetation, consisting of high forest (0.8 percent), low forest (13.8 percent), thicket (43.4 percent), wooded grasslands (19.5 percent) and mangroves (0.5 percent). The total cultivable land is estimated at 36 million ha, which is 45 percent of the total area of the country. In 2002, the cultivated area was estimated at 4.44 million ha, of which 4.20 million ha arable land, while 0.24 million ha were under permanent crops (Table 1).

The climate varies from tropical and subtropical conditions in the north and central parts of Mozambique to dry semiarid steppe and dry arid desert climate in the south. The hottest regions are located in the Zambezi basin, the coastline of Cabo Delgado, Nampula, Zambezia and Sofala. The south is the coolest part of the country, with an average maximum and minimum temperature of 30 °C and 19 °C respectively.

The annual average precipitation for the whole country is 1 032 mm and the rainy season lasts from October to April. Precipitation varies widely from the coast to the inland areas and from north to south. Average rainfall ranges from 800 to 1 000 mm along the coast, with values above 1 200 mm between Beira and Quelimane. The rainfall decreases inland reaching 400 mm at the border with South Africa and Zimbabwe. The north and central part of the country has annual rainfall from 1 000 to over 2 000 mm because of the northeast monsoon and high mountains. In the southern inland part of the country average annual rainfall ranges from 500 to 600 mm. Evapotranspiration varies between 800 and above 1 600 mm. Along the coast it varies between 1 200 and 1 500 mm. Maximum values of above 1 600 mm occur in the eastern and middle Zambezi basin. Values around 800 mm occur in central Niassa and on the border with Zimbabwe.

TABLE 1
Basic statistics and population

Physical areas			
Area of the country	2002	80 159 000	ha
Cultivated area (arable land and area under permanent crops)	2002	4 435 000	ha
• as % of the total area of the country	2002	5.5	%
• arable land (annual crops + temp. fallow + temp. meadows)	2002	4 200 000	ha
• area under permanent crops	2002	235 000	ha
Population			
Total population	2004	19 182 000	inhabitants
• of which rural	2004	63	%
Population density	2004	24	inhabitants/km ²
Economically active population	2004	10 041 000	inhabitants
• as % of total population	2004	52	%
• female	2004	51	%
• male	2004	49	%
Population economically active in agriculture	2004	8 065 000	inhabitants
• as % of total economically active population	2004	80	%
• female	2004	60	%
• male	2004	40	%
Economy and development			
Gross Domestic Product (GDP) (current US\$)	2003	4 300	million US\$/yr
• value added in agriculture (% of GDP)	2002	23.5	%
• GDP per capita	2003	228	US\$/yr
Human Development Index (highest = 1)	2002	0.354	
Access to improved drinking water sources			
Total population	2002	42	%
Urban population	2002	76	%
Rural population	2002	24	%

Total population is estimated at 19.2 million (2004), with a population growth rate of 2 percent (Table 1). The population density was 24 inhabitants/km² and 63 percent of the population is rural. Mozambique is one of the poorest countries in the world, ranking 170 out of 173 countries on the Human Development Index 2002 of UNDP. Some 70 percent of the population live below the poverty line. In 2002, 76 percent of the urban and 24 percent of the rural population were using improved drinking water sources (Table 1).

ECONOMY, AGRICULTURE AND FOOD SECURITY

Mozambique's GDP was US\$4.3 billion in 2003, and the value added by agriculture was 23.5 percent of the GDP in 2002. Agriculture provides work for 80 percent of the economically active population, and 60 percent of the people working in the sector are female. Since the end of the civil war in 1992, Mozambique has made impressive gains in restoring food production and at a national level the country is virtually self-sufficient in terms of food grain production, with the exception of wheat and rice. However, this growth has been uneven spatially and natural disasters such as flood and drought are an important cause of temporary food insecurity.

The agriculture sector comprises two categories of producers: the smallholder "family" sub-sector and the commercial sub-sector:

- The smallholder sub-sector accounts for about 95 percent of the area under production and produces almost all the food crops, such as maize, cassava, rice and beans. It is characterized by small areas (1.8 ha each on average), low inputs, inadequate equipment and low yields and returns; almost all production is rainfed, as the farmers cannot afford to install irrigation systems. Within this sector a small group of emergent commercial farmers exists who use some agricultural inputs and sell their products in local markets. This group believes

that one of their prime needs is the establishment or improvement of irrigation systems.

- Small and medium private companies represent the commercial sub-sector. These companies have some technological know-how, use agricultural inputs, generally have access to credit and, particularly in the south of the country, have access to irrigation. They are an important source of employment and notably contribute to technology dissemination and transfer. Their production is directed to supplying national markets, the agro-industries and for exportation. The main export crops are cotton, cashew nuts, sugar cane, tobacco and tea.

The prevalence of HIV/AIDS among adults (15-49 years) was 13 percent by end-2001, with the central provinces of Zambezia, Tee, Manica and Sofala being affected above average.

WATER RESOURCES AND USE

Water resources

Mozambique has 104 identified river basins that drain the central African highland plateau into the Indian Ocean. The majority of the rivers have a highly seasonal, torrential flow regime, with high waters during 3-4 months and low flows for the remainder of the year, corresponding to the distinct wet and dry seasons.

Groundwater potential is considerable and lies in the alluvial formations of the various rivers. Well yields in the Zambezi and Incomati basins are up to 70 000 m³/day.

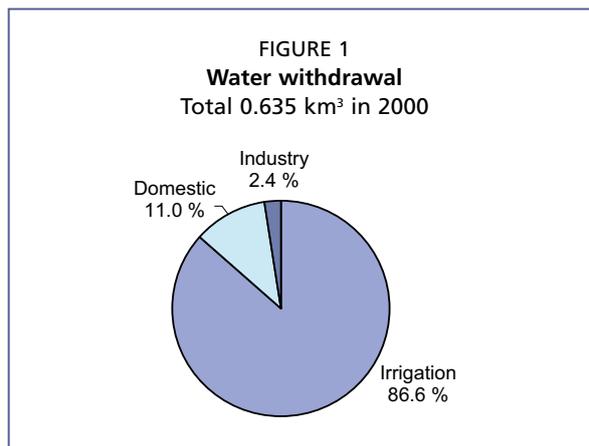
In Mozambique, 97.3 km³ of surface water and 17 km³ of groundwater are produced annually. Considering an overlap between surface water and groundwater of 14 km³/yr, the total internal renewable water resources are 100.3 km³/yr (Table 2). In addition, 116.8 km³ of surface water enter the country annually, of which 66 percent from the Zambezi River, and thus total actual renewable water resources become 217.1 km³/yr.

The two main lakes are Lake Niassa (Lake Malawi) and Lake Chirua (Lake Chilwa), both of which are shared with Malawi. The total surface area of Lake Niassa is 30 800 km², of which 21 percent belong to Mozambique. Lake Chirua has an average total area of 750 km² of which no more than 29 km² are within Mozambique. In addition

TABLE 2

Water: sources and use

Renewable water resources			
Average precipitation		1 032	mm/yr
		827	10 ⁹ m ³ /yr
Internal renewable water resources		100.3	10 ⁹ m ³ /yr
Total actual renewable water resources		217.1	10 ⁹ m ³ /yr
Dependency ratio		53.8	%
Total actual renewable water resources per inhabitant	2004	11 318	m ³ /yr
Total dam capacity	2000	64 474	10 ⁶ m ³
Water withdrawal			
Total water withdrawal	2000	635	10 ⁶ m ³ /yr
- irrigation + livestock	2000	550	10 ⁶ m ³ /yr
- domestic	2000	70	10 ⁶ m ³ /yr
- industry	2000	15	10 ⁶ m ³ /yr
• per inhabitant	2000	36	m ³ /yr
• as % of total actual renewable water resources	2000	0.3	%
Non-conventional sources of water			
Produced wastewater		-	10 ⁶ m ³ /yr
Treated wastewater		-	10 ⁶ m ³ /yr
Reused treated wastewater		-	10 ⁶ m ³ /yr
Desalinated water produced		-	10 ⁶ m ³ /yr
Reused agricultural drainage water		-	10 ⁶ m ³ /yr



to the two main lakes, there are more than 1 300 small lakes, 20 of which have an area of between 10 and 100 km².

The total capacity of 27 dams with a height of 10 m or more is estimated at 64.5 km³. This refers mostly to the useful reservoir capacity. The Cahora Bassa dam on the Zambezi River is the largest hydroelectric plant in southern Africa with an installed capacity of 2 060 MW and a useful storage capacity of 39.2 km³. In 1971, 583 small dams (of which 90 percent were for irrigation or livestock watering) were registered, with a total volume of 60 million m³. It is believed that most of them were destroyed during the war.

Water use

Water use estimates for the year 2000 indicate a total water withdrawal of 635 million m³ (Table 2 and Figure 1). The main consumer of water is agriculture, accounting for 550 million m³ (87 percent), followed by the domestic sector using 70 million m³ (11 percent) and industry consuming 15 million m³ (2 percent).

The main source of water in Mozambique is surface water. However, groundwater is utilized on a large scale in a number of urban centres for drinking water supply. Handpump-mounted boreholes and shallow wells are used throughout the country as the main source of drinking water in rural areas.

International water issues

Mozambique shares nine river basins with other countries:

- The Maputo basin, shared with South Africa and Swaziland. The river flows through an area of rich biodiversity recognized by UNEP and having the status of a world conservation area.
- The Umbeluzi basin, shared with South Africa and Swaziland. The river is important for the water supply of the capital Maputo. A large irrigation scheme exists in Swaziland and there are smallholder schemes in Mozambique. The two countries have signed an agreement for water sharing, but this agreement is not favorable to Mozambique.
- The Incomati basin, shared with South Africa and Zimbabwe. Water is intensively used in South Africa mainly for irrigation, and Mozambique has some important irrigation schemes too. The flows in the main river have been very much reduced in the last 15 years.
- The Limpopo basin, shared with South Africa, Botswana and Swaziland. The largest irrigation scheme of Mozambique, Chokwé, is located in this basin. Intensive water use in the upstream countries, especially Zimbabwe and South Africa, reduces the flows entering Mozambique. The river is now dry for 3 or 4 months in a normal year, and can actually fall dry for a period of up to 8 months in a year. There are also water quality problems at the border inflows.
- The Save basin, shared with Zimbabwe. During the 1980s, Zimbabwe carried out an intensive program for water resources development in this large basin. As a result, the Save is now dry almost on a permanent basis.
- The Pungue basin, shared with Zimbabwe.
- The Zambezi basin, shared with Angola, Namibia, Botswana, Zambia, Zimbabwe, Malawi and the United Republic of Tanzania. One of the largest

river basins in Africa and the most important one in Mozambique. It accounts for about 50 percent of the surface water resources of the country and about 80 percent of its hydropower potential with the Cahora Bassa dam.

- The Rovuma basin, shared with the United Republic of Tanzania.

There are many agreements between Mozambique and upstream neighbouring countries regulating the use of shared watercourses. Recently a new agreement was signed with Swaziland regarding the management of the Incomati River.

IRRIGATION AND DRAINAGE DEVELOPMENT

Evolution of irrigation development

Irrigation potential was estimated to be 3 072 000 ha by FAO, while other sources give 3 300 000 ha. The major areas suitable for irrigation are in the centre and north; the Zambezia province alone accounts for about 60 percent of the irrigation potential. The southern provinces have the highest need for irrigation but have only a small share of the land suitable for irrigation.

The country's tradition of irrigation dates back to the pre-independence period. In 1968 the irrigated lands totaled 65 000 ha, out of which 72 percent were located in the Maputo and Gaza provinces. In 1973 this area had increased to 100 000 ha due to the establishment of sugar companies and Limpopo settlers, with the major area still being located in the southern provinces of Maputo and Gaza. Portuguese settlers mainly exploited these lands, while Mozambicans did not practice irrigated agriculture. After independence in 1975, the irrigated area in the country was increased by about 20 000 ha, and the total equipped area reached almost 120 000 ha in the early 1980s. Most of the areas were again in Maputo and Gaza, where significant water development works were implemented at the same time: the Pequenos Libombos Dam on the Umbeluzi River, the Corumana Dam on the Sabie River and the Massingir Dam on the Elefantes River. In the years following independence, the government encouraged the exploitation of existing large irrigation schemes by state companies. These companies however became a symbol of inefficiency, mismanagement and the subsequent deterioration of the irrigation infrastructures.

At the present time, irrigated areas are occupied by smallholders and agricultural enterprises. The most important large schemes are the Chokwé scheme in the Limpopo basin (25 000 ha equipped area) and a series of sugar cane plantations in the Incomati, Buzi and Zambezi valleys (34 000 ha equipped area). Small-scale irrigation exists everywhere in the country, either abandoned or partly utilized. Most of the schemes are in a bad to very bad condition, and only a relatively small part of the irrigation schemes is actually irrigated. Reasons for this are:

- After independence the original owners abandoned the irrigated lands, and the new owners greatly lacked experience in the operation and maintenance of schemes.
- The extended civil war led to the destruction of irrigation infrastructures and forced the abandonment of others.
- Public funds for irrigation were gradually reduced.
- The lack of inputs and technical assistance in the rural areas for maintenance operations and improvements of irrigation schemes.
- The floods in 2000 and 2001 completely submerged many irrigated schemes and deposited large quantities of sediments in all natural and man-made irrigation and drainage channel networks.

Currently, 118 120 ha are equipped for irrigation, of which 40 063 ha are actually irrigated, consisting mainly of large schemes over 500 ha (Table 3 and 4 and Figure 2).

Basin irrigation for rice and furrow irrigation for different types of vegetables are practised. Sprinkler irrigation is widespread with agricultural companies, especially in sugar cane plantations, but also for citrus fruits and vegetables. Some producers

TABLE 3
Irrigation and drainage

Irrigation potential		3 072 000	ha
Water management			
1. Full or partial control irrigation: equipped area	2001	118 120	ha
- surface irrigation		-	ha
- sprinkler irrigation		-	ha
- localized irrigation		-	ha
• % of area irrigated from groundwater		-	%
• % of area irrigated from surface water		-	%
2. Equipped lowlands (wetland, ivb, flood plains, mangroves)		-	ha
3. Spate irrigation		-	ha
Total area equipped for irrigation (1+2+3)	2001	118 120	ha
• as % of cultivated area	2001	3	%
• average increase per year over the last 8 years	1993-2001	1.3	%
• power irrigated area as % of total area equipped		-	%
• % of total area equipped actually irrigated	2001	34	%
4. Non-equipped cultivated wetlands and inland valley bottoms		-	ha
5. Non-equipped flood recession cropping area		-	ha
Total water-managed area (1+2+3+4+5)	2001	118 120	ha
• as % of cultivated area	2001	3	%
Full or partial control irrigation schemes		Criteria	
Small-scale schemes (Class A)	< 50 ha	2001	6 389 ha
Medium-scale schemes (Class B)	50 - 500 ha	2001	19 647 ha
Large-scale schemes (Class C)	> 500 ha	2001	92 084 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	1994	2	%
Total harvested irrigated cropped area		-	ha
• Annual crops: total		-	ha
- sugar cane	2001	23 858	ha
- vegetables	2001	7 011	ha
- rice	2001	4 130	ha
- tobacco	2001	445	ha
- other annual crops		-	ha
• Permanent crops: total		-	ha
- citrus	2001	370	ha
- other permanent crops		-	ha
Irrigated cropping intensity		-	%
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	1993	2 000	ha
Population affected by water-related diseases		-	inhabitants

employ drip irrigation to produce tomatoes (3 347 ha or 8 percent of the actually irrigated area); 50 percent of the actually irrigated area is under sprinkler irrigation, while the remaining 42 percent use surface irrigation (Figure 3).

In most irrigation schemes, surface water from rivers is used. Groundwater is used to a very limited extent by the family smallholder sector.

In the north of the country there are only a few large-scale irrigation schemes that are actually irrigated, and only irrigation of class A and B schemes is operative. In the south part of the country, class C schemes account for approximately 80 percent of the equipped area. Class A schemes are mostly operated by farmers individually or organized in an association. Class B schemes are usually managed for industrial exploitation, mainly sugar cane and rice. Class C schemes are not promoted any more,

TABLE 4
Irrigation in Mozambique

Item	North		Centre		South		Total	
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)
Area equipped for irrigation:								
Class A (< 50 ha)	592	17	1 428	4	4 369	6	6 389	5
Class B (50-500 ha)	1 760	53	6 653	17	11 234	15	19 647	17
Class C (> 500 ha)	1 000	30	30 949	79	60 135	79	92 084	78
Total	3 352	100	39 030	100	75 738	100	118 120	100
Area actually irrigated:								
Class A (< 50 ha)	200	30	624	4	2 452	11	3 276	8
Class B (50-500 ha)	461	70	1 584	10	2 635	11	4 680	12
Class C (> 500 ha)	0	0	14 049	86	18 058	78	32 107	80
Total	661	100	16 257	100	23 145	100	40 063	100
Part of equipped area actually irrigated:								
Class A (< 50 ha)		34		44		56		51
Class B (50-500 ha)		26		24		23		24
Class C (> 500 ha)		0		45		30		35
Total		20		42		31		34
Irrigation technology in actually irrigated area:								
Surface irrigation	656	99	4 200	26	12 000	52	16 856	42
Sprinkler irrigation	0	0	11 530	71	8 330	36	19 860	50
Localized irrigation	5	1	527	3	2 815	12	3 347	8
Total	661	100	16 257	100	23 145	100	40 063	100
Main irrigated crops:								
Sugar cane	0	0	13 799	90	10 059	50	23 858	67
Vegetables	301	100	210	2	6 500	32	7 011	20
Rice	0	0	480	3	3 650	18	4 130	11
Tobacco	0	0	445	3	0	0	445	1
Citrus	0	0	370	2	0	0	370	1
Total	301	100	15 304	100	20 209	100	35 814	100

as most of the recent projects are aimed at the rehabilitation and development of class A and B schemes.

Role of irrigation in agricultural production, the economy and society

The main irrigated crops are sugar cane, rice, citrus fruits and vegetables (mostly tomatoes and lettuce), which are cultivated with a low intensity of 1.1-1.2 crops/year (Table 3 and Figure 4).

The cost of irrigation system development varies according to the type of irrigation technology. For surface irrigation it ranges from US\$1 000 to 1 500/ha, and for sprinkler irrigation from US\$1 500 to 2 000/ha. Maintenance costs are around US\$500/ha per year. The rehabilitation cost, depending on the condition of the old system, can vary between US\$500 and 1 500/ha.

The climate of Mozambique means that the risk of harvest loss in rainfed agriculture exceeds 50 percent in all regions south of the Save River, and can reach up to 75 percent in the interior of the Gaza province. The centre

FIGURE 2
Types of full/partial control irrigation schemes in equipped area and actually irrigated area
Total equipped 118 120 ha and total actually irrigated 40 063 ha in 2001

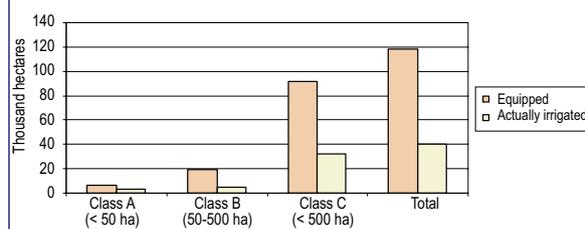
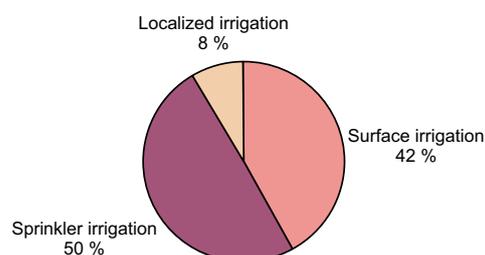
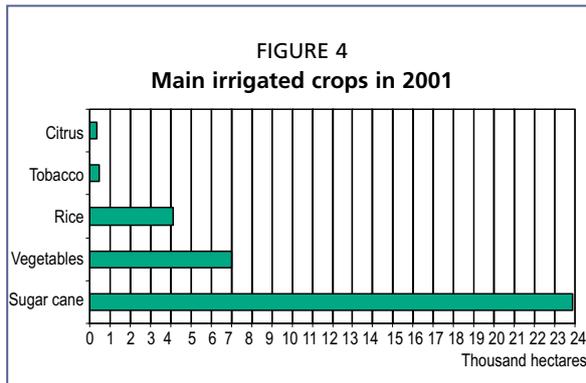


FIGURE 3
Irrigation techniques in actually irrigated areas
Total 40 063 ha in 2001





and north regions of the country have more appropriate conditions for rainfed agriculture, where the probability of good harvests during the wet season is 70-95 percent. The north of the Manica province and the south of the Tete province regions are excluded from this Centre-North region, as they have a risk of harvest loss in rainfed crops of usually more than 50 percent.

Irrigation efficiency is reduced to 25-50 percent, mainly in the surface irrigation areas of smallholder farmers. In agricultural companies, which use mainly sprinkler irrigation, efficiency rates are up to 70 percent.

At the smallholder level, high value crops are traditionally grown by men. Although women play an active role in all activities of irrigated production, they are in general not involved in planning and decision-making regarding the management of the scheme.

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

Institutions

The National Directorate for Agricultural Hydraulics (DNHA) within the Ministry of Agriculture and Rural Development (MADER) is the coordinating authority for activities relating to irrigation and drainage. It performs studies, executes agricultural hydraulics projects and supports smallholder irrigation development. Inside the DNHA, the *Programa nacional de irrigacao de pequena escala* (PRONIPE) was specifically created for small-scale irrigation.

The Fund for Agricultural Hydraulics Development (FDHA) is in charge of promoting, fostering and funding the hydro-agricultural works or other activities related to irrigated agricultural development.

The National Water Directorate (DNA) within the Ministry of Public Works and Housing (MOPH) is in charge of policy making and implementation, overall planning and management of the country's water resources and the provision of water supply and sanitation services. Its objectives are to ensure the proper utilization of ground- and surface water resources. In the DNA, a liaison office of international rivers was established. The Regional Water Administrations (ARAs) are basin authorities responsible for water development and management. They have administrative, organizational and financial autonomy but report to the DNA. The ARAs are also in charge of collecting hydrological information.

The National Water Council (CNA) was created in 1991 as a consultative body to the Council of Ministers. In general, however, the CNA has not been very effective and coordination between agencies involved in water resources management has been a constant source of concern.

Water management

At the national level, water management is the responsibility of the National Water Directorate (DNA), while at the regional level the five Regional Water Administrations (ARAs) are responsible. They control the irrigation systems and collect water fees. The only ARA fully operational by 2000 was ARA-Sul (South), while a second one, ARA-Centro, is under formation. ARA-Sul is in charge of the southern part of the country up to the Save River, where most problems of water management exist. In areas not yet covered by an ARA, the Provincial Directorates of Public Works and Housing are the authority responsible for water resources management in the province.

The territorial responsibility of the five ARAs is as follows (Table 5):

- ARA South, which includes all the basins south of the Save, and the Save River basin itself.
- ARA Centre, which covers all the basins between the Save and Zambezi basins.
- ARA Zambezi, which corresponds to the Zambezi basin.
- ARA Centre-North, which covers the Zambezi basin as far as the Lurio River, including the Lurio basin.
- ARA North, which covers all the basins north of the Lurio basin.

TABLE 5
Characteristics of areas of responsibility of Regional Water Administrations (ARAs)

ARA	Mean annual runoff		
	At border (km ³)	Generated in Mozambique (km ³)	Total (km ³)
South	17.0	3.8	20.8
Centre	1.2	18.4	19.6
Zambezi	88.0	18.0	106.0
Centre-North	0.0	35.2	35.2
North	10.0	24.9	34.9
Total	116.2	100.3	216.5

Policies and legislation

The 1991 Water Law is based on a river basin approach towards water management. According to this law, water and hydraulic structures of public interest are State property. By law, the Ministry of Public Works and Housing is responsible for water management. Furthermore, the social, economic and environmental impact of hydraulic works has to be assessed before their implementation.

The National Water Policy was issued in 1995, listing nine principal policies with the main aim being to guarantee the attainment of a sustainable water supply and sanitation. Declarations pertaining to agricultural water management in the policy are:

- The Government will promote private sector participation in order to obtain full benefit from existing irrigation and hydroelectric schemes.
- Conditions should be created for the attraction of private investment to make full use of the existing investments already made in dams for irrigation and electricity generation, and to rehabilitate small water impoundments. In the beginning the private sector could participate in the rehabilitation and extension of irrigation systems and the rehabilitation of small works as part of integrated rural development programs.

The National Irrigation Policy and its Implementation Strategy were adopted in 2002, recognizing the great strategic importance vested with irrigation. The guiding principles are:

- Water resources, although renewable, are not inexhaustible and therefore it is necessary to manage, control and preserve them rigorously.
- Water is an economic resource, which deserves an appropriate economic and social value.
- Water and irrigated land are public assets whose use has to depend on a licence.
- The hydrographic basin is a geographical water management unit for hydro-agricultural purposes which has to abide by ordinations established in the basin usage plans.
- The Government will focus on: i) ensuring integrated water management for multiple purposes in agriculture and rural development; ii) promoting irrigated agriculture and the respective research, adaptation and adequacy of appropriate technologies, particularly empowering the development of irrigation systems for the family sector so as to transform agricultural production (preponderantly subsistence) to one that is gradually integrated in the market; iii) promoting and fostering the entrepreneurial sector in irrigated agriculture, including small, medium and large enterprises; iv) activating the development of the

irrigation potential in Mozambique through the promotion of new irrigation systems, of medium and large scale; v) establishing technical and financial mechanisms to prevent and mitigate the occurrences and the impact of cyclic droughts; vi) promoting decentralization and fostering a greater participation of the beneficiaries, communities and the local authorities in the integrated water resources management as well as in the management and operation of infrastructures; and vii) acknowledging the role of women in agriculture, creating a stimulus for their economic and social affirmation through their participation as beneficiaries of irrigated agriculture.

ENVIRONMENT AND HEALTH

The pollution of water from agriculture is not significant, because most production is by smallholders, whose level of fertilizer use and other artificial input is low because of lack of funding.

Saline soils do occur in some areas in the country as a result of poor water management or the use of saline water for irrigation (for example, parts of the Chokwé irrigation scheme). However, there are also areas where saline soils occur naturally in Mozambique. This situation is common in the dry zone in the southern part of the country, in the Gaza province in the area of Pafuri, where rainfall is below 400 mm.

Despite the lack of specific studies carried out in the irrigation schemes on prevailing diseases, it has been asserted that the prevalence of water communicable diseases tends to be worsened by irrigation. The diseases commonly associated with irrigation are malaria, diarrhoea, cholera and to a lesser extent bilharzia.

PERSPECTIVES FOR AGRICULTURAL WATER MANAGEMENT

The Implementation Strategy of the National Irrigation Policy proposes the following:

- To valorize the water through the improvement of water use efficiency.
- To ensure appropriate maintenance of the systems and minimization of water losses through transfer of responsibilities to the users.
- To have a modest price of water for family units and irrigation associations and to reflect the cost for commercial agriculture organized on an entrepreneurial basis.
- To promote and stimulate small-scale irrigation by the family sector by mobilizing financial and technical resources, in order to gradually transform the current subsistence-oriented agriculture into a market-integrated one.
- To use alternatives to conventional irrigation, such as use of low lying and humid areas through low-cost techniques.
- To support capacity building for the management, operation and maintenance of irrigation schemes.
- To undertake research, adaptation and adequacy of appropriate technologies.
- To implement development centres and dissemination of successful water retention systems.
- To ensure participation of local beneficiaries and other stakeholders in the whole irrigation process, from planning and water resource management to the rehabilitation, maintenance and management of the existing irrigation schemes.
- The State to establish the legislative framework regarding the authorization of the usage of water, irrigable land and public irrigation infrastructures, in accordance with the provisions above mentioned.

The main trends in agricultural water management are to promote small-scale irrigation throughout the country, to increase water use efficiency and to integrate irrigation into the social and economic context. However, the insufficient institutional

capacity both at the central and local levels is the major constraint hampering the development of the small-scale irrigation sub-sector. The institutions dealing specifically with irrigated agriculture are severely constrained by insufficient qualified human resources and an inadequate budget. A point of concern for the development of irrigation as a whole is the lack of flexibility of the legal and political framework concerning the access to and use of land and water.

In terms of irrigation technology, the government is advancing the use of treadle pumps in a number of projects in the country. Irrigation using treadle pumps is beneficial for farmers because the level of required maintenance is low and there is no operational cost.

A major challenge is posed by the deteriorated status of the hydro-agricultural infrastructure, requiring investment and technical assistance for its rehabilitation as well as maintenance operations. Improvements have been hampered by the lack of means, input and technical assistance. Nevertheless, the existing physical infrastructure represents a valuable asset for the economy of Mozambique.

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