Liberia

GEOGRAPHY, CLIMATE AND POPULATION

Liberia, located in West Africa, covers an area of 111 370 km². It borders Sierra Leone to the northwest, Guinea to the north, Cote d'Ivoire to the northeast and east, and the Atlantic Ocean to the south and southwest. Its north-south extent is about 465 km and its Atlantic Ocean coastline is about 520 km long. The terrain comprises mostly flat to rolling coastal plains, rising to rolling plateau and low mountains in the northeast. The coastline is characterized by lagoons, mangrove swamps, and river-deposited sandbars. The country can be divided according to elevation into four main physical regions parallel to the coast: i) coastal plains up to 100 m; ii) hills from 100 to 300 m; iii) plateaus from 300 to 600 m; and iv) mountainous areas above 600 m. In 2002, the cultivated area was estimated at 600 000 ha, of which arable land covers 380 000 ha, while 220 000 ha are covered by permanent crops (Table 1).

TABLE 1
Basic statistics and population

Physical areas			
Area of the country	2002	11 137 000	ha
Cultivated area (arable land and area under permanent crops)	2002	600 000	ha
• as % of the total area of the country	2002	5.4	%
• arable land (annual crops + temp. fallow + temp. meadows)	2002	380 000	ha
• area under permanent crops	2002	220 000	ha
Population			
Total population	2004	3 487 000	inhabitants
• of which rural	2004	52	%
Population density	2004	31	inhabitants/km²
Economically active population	2004	1 318 000	inhabitants
• as % of total population	2004	38	%
• female	2004	40	%
• male	2004	60	%
Population economically active in agriculture	2004	863 000	inhabitants
• as % of total economically active population	2004	65	%
• female	2004	45	%
• male	2004	55	%
Economy and development			
Gross Domestic Product (GDP) (current US$)	2003	442.2	million US$/yr
• value added in agriculture (% of GDP)		-	%
• GDP per capita	2003	131	US$/yr
Human Development Index (highest = 1)		-	
Access to improved drinking water sources			
Total population	2002	62	%
Urban population	2002	72	%
Rural population	2002	52	%

Liberia's climate is tropical hot-humid. Winters are dry with hot days and cool to cold nights; summers are wet and cloudy with frequent heavy showers. The rainy season lasts from April to November and average annual rainfall is estimated at 2 391 mm, with a spatial variation from 2 000 to 5 000 mm. Although this is much higher than the quantity of water required for crop growth, an acute water deficit is experienced anyway during a 3 to 5 month period, particularly in the uplands.

Total population in 2004 was 3.5 million, of which 52 percent were rural (Table 1). Population density was 31 inhabitants/km^2.

Liberia is in a post-war period facing serious political, financial, administrative and organizational problems. Ten years of conflict have led to multiple internal displacements of hundreds of thousands of people, disrupted supply of basic social services, increased the vulnerability of women and children to extreme poverty, hunger, disease and HIV/AIDS. Poverty is widespread.

Access to education is limited. An estimated 80 percent of schools, health service structures, water wells and sanitation facilities have been either destroyed or abandoned since 1998. No up-to-date water supply and sanitation coverage data are available, but those still functioning are in alarming and worrying conditions in almost all counties in Liberia. As a result, morbidity and mortality rates remain high and may possibly deteriorate further as populations returning to these areas are expected to increase and thereby overstretch the already either only partly functioning or malfunctioning health and social infrastructures.

ECONOMY, AGRICULTURE AND FOOD SECURITY

Before the outbreak of civil war, agriculture accounted for about 40 percent of GDP and Liberia had been a producer and exporter of basic products - primarily raw timber and rubber. The rubber industry generated over US$100 million export earnings annually. By the end of 1996, real GDP was as low as 10 percent of its pre-war level. However, from 1997 it increased, reflecting a post-war surge in rice, timber and rubber production, and in 2002, reached US$442 million. Nonetheless, in 2004, a still unsettled domestic security situation was slowing the process of rebuilding the social and economic structure of the country. In 2000, agriculture and forestry contributed over 90 percent of export earnings, mainly from rubber, timber, cocoa and coffee.

Agricultural activities are still considerably reduced and food insecurity is worsening, as the areas considered to be the "food basket" of Liberia are still inaccessible. Rice production in 1995 was only 23 percent of the pre-civil war level. Cassava production has also been falling, possibly by as much as 50 percent. Low productivity of land and labour, shifting cultivation and low livestock production remain the main characteristics of traditional farming in Liberia. Rainfed agriculture is the predominant system. Use of water control technology is exceptional and consists mainly of unregulated manual irrigation, using watering cans.

Liberia is far from being food self-sufficient, with net cereal imports and food aid as a percent of total consumption being 44.1 percent for the period 1998–2000. The variation in domestic cereal production between 1992–2001 (average percent variation from mean) was 44.5 percent.

WATER RESOURCES AND USE

Water resources

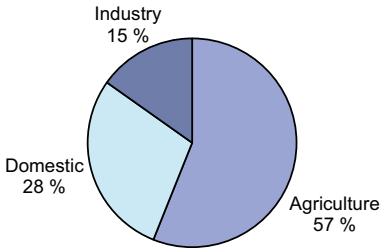
Liberia can be divided into two kinds of river systems:

- The major basins, which drain 97 percent of the territory in a general northeast-southwest direction. Of these, the six major rivers, originating in Sierra Leone, Guinea or in Côte d'Ivoire, are the Mano, Lofa, Saint Paul, Saint John, Cestos and Cavalla, and together drain 65.5 percent of the country;

- The short coastal watercourses, which drain about 3 percent of the country.

Internal renewable surface water resources are estimated to be 200 km³/year and internal groundwater is estimated to be 60 km³/year; all of the latter is believed to be drained by watercourses. Thus, the total internally produced renewable water resources become 200 km³/year, while an additional 32 km³/year comes from Guinea and Côte d'Ivoire, bringing the total renewable water resources to 232 km³/year. Liberia is one of the African countries with the highest amount of renewable water resources per inhabitant: more than 71 000 m³/year.

FIGURE 1
Water withdrawal
Total: 0.1068 km³ in 2000



Water use

Total water withdrawal in the year 2000 was estimated at 106.8 million m³. The main water user was agriculture with 60 million m³/year (57 percent), followed by the domestic sector with 30.4 million m³/year (28 percent) and industry with 16.4 million m³/year (15 percent) (Table 2 and Figure 1).

International water issues

Liberia shares rivers with all its neighboring countries:

- The Mano and Mugowi Rivers with Sierra Leone;
- The Makone, Lofa, Via, Nianda and Mani Rivers with Guinea;
- The Cavalla River with Côte d'Ivoire, which forms a large part of the border between the two countries.

IRRIGATION AND DRAINAGE DEVELOPMENT

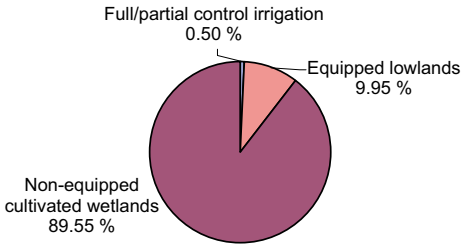
Evolution of irrigation development

The irrigation potential in Liberia is estimated at 600 000 ha, consisting mainly of freshwater swamps. No up-to-date information on irrigated areas in Liberia is available.

TABLE 2
Water: sources and use

Renewable water resources			
Average precipitation		2 391	mm/yr
		266.3	10^9 m³/yr
Internal renewable water resources		200	10^9 m³/yr
Total actual renewable water resources		232	10^9 m³/yr
Dependency ratio		13.8	%
Total actual renewable water resources per inhabitant	2004	66 533	m³/yr
Total dam capacity		-	10^6 m³
Water withdrawal			
Total water withdrawal	2000	106.8	10^6 m³/yr
- irrigation + livestock	2000	60.0	10^6 m³/yr
- domestic	2000	30.4	10^6 m³/yr
- industry	2000	16.4	10^6 m³/yr
• per inhabitant	2000	36.3	m³/yr
• as % of total actual renewable water resources	2000	0.05	%
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
Reused agricultural drainage water		-	10^6 m³/yr

FIGURE 2
Distribution of the water managed areas
Total: 20 100 ha in 1987



In 1987, the total water managed area was 20 100 ha (Table 3 and Figure 2), comprising:

- About 100 ha equipped for full or partial control irrigation, consisting mainly of small development projects supported through international or bilateral cooperation;
- 2 000 ha of equipped wetlands and inland valley bottoms, mainly cropped with rice;
- 18 000 ha of non-equipped cultivated wetlands, swamps and inland valley bottoms.

FAO's Special Program for Food Security (SPFS) 2000–2002 had the following aims:

- Developing 50 ha of small swamps, complete with drainage/irrigation channels and required water control structures;

TABLE 3
Irrigation and drainage

Irrigation potential			**600 000**	**ha**
Water management				
1. Full or partial control irrigation: equipped area		1987	100	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)		1987	2 000	ha
3. Spate irrigation			-	ha
Total area equipped for irrigation (1+2+3)		**1987**	**2 100**	**ha**
• as % of cultivated area		1987	0.3	%
• average increase per year over the last .... years			-	%
• power irrigated area as % of total area equipped			-	%
• % of total area equipped actually irrigated			-	%
4. Non-equipped cultivated wetlands and inland valley bottoms		1986	18 000	ha
5. Non-equipped flood recession cropping area			-	ha
Total water-managed area (1+2+3+4+5)		**1987**	**20 100**	**ha**
• as % of cultivated area		1987	3.3	%
Full or partial control irrigation schemes	**Criteria**			
Small-scale schemes	< ha		-	ha
Medium-scale schemes			-	ha
Large-scale schemes	> ha		-	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			-	%
Total harvested irrigated cropped area			-	ha
• Annual crops: total			-	ha
• Permanent crops: total			-	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			-	ha
Population affected by water-related diseases			-	inhabitants

- Training of farmers and extension staff in the utilization and repair of treadle and petrol pumps;
- Training of farmers and extension staff in water control practices at field level, irrigated field maintenance and improved cultivation methods (particularly rice and vegetables);
- Demonstration of low-cost small-scale irrigation technologies on 10 ha using treadle pumps and petrol pumps, and of water management practices with the participation of farmers and extension workers.

Role of irrigation in agricultural production, the economy and society

The main irrigated crop is rice. It is grown in the swamps in addition to the upland rice. Shifting cultivation in the uplands is still the main technique: the secondary forest is cleared and burned, and upland rice is cropped during one or two years combined with different food crops (cassava, common groundnuts or vegetables). Afterwards, the area returns to bush fallow for 8–10 years. This system is the preferred mode of farming in Liberia and has the advantage of maintaining the ecological system in equilibrium. However, this system cannot be applied in areas where a higher population density prevents the restoration of soil fertility due to too short a fallow period. In those areas, swamp rice is cultivated in addition to upland crops.

While in the mid-1980s about 235 000 ha of rice were cultivated, this figure dropped to 120 000 ha in 2003, leading to a decrease in total rice production from about 290 000 tonnes in the mid-1980s to 110 000 tonnes in 2003. In 1995, the yield of upland rice was estimated to be 1.3 tonnes/ha, while yields of swamp rice were about 1.6 tonnes/ha, and yields in equipped wetlands and swamps reached more than 2 tonnes/ha.

Gender and land tenure with regard to water management has been a well-known problem for projects in Liberia.

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

Institutions

The National Water Resources and Sanitation Board was created in 1981 in order to coordinate the activities of the different institutions or corporations involved in the management of water resources. Before the conflict, the main institutions involved were:

- The Liberia Water and Sewer Corporation (LWSC), in charge of the water supply systems in the urban areas;
- The Ministry of Agriculture, in charge, inter alia, of irrigation;
- The Ministry of Health and Social Affairs, in charge of sewerage;
- The Liberia Electricity Corporation, in charge of hydro-electric energy production;
- The Ministry of Rural Development in charge of water supply in rural areas;
- The Hydrology Service of the Ministry of Land, Mines and Energy.

ENVIRONMENT AND HEALTH

Main environmental problems in Liberia are tropical rain forest deforestation, soil erosion, loss of biodiversity, and pollution of coastal waters from oil residue and raw sewage. Water-borne diseases such as diarrhoea, dysentery, cholera and infectious hepatitis are common.

PERSPECTIVES FOR AGRICULTURAL WATER MANAGEMENT

With only about 3 percent or about 20 000 ha of a potential 600 000 ha of swampland cultivated with rice before the war, water control and soil management measures

remain the most suitable vehicle for future development. Water deficiency in the dry season, poor drainage, flooding of lowlands and the hazard of water erosion are all problems that need to be addressed.

The development of swamp rice cultivation will become necessary with increasing population and population density. It has been estimated that with an intensification of swamp rice cultivation, it could be possible for Liberia to become self-sufficient in rice, which is the staple food crop. The urban demand for rice is also rapidly expanding.

Successful swamp rice production development in Liberia requires: i) application of improved swamp rice cultivation technologies; ii) high labour inputs, which can conflict with upland farming needs; iii) availability of modern inputs (improved cultivars, good quality seed, fertilizers); and iv) a change of mentality amongst farmers, who should consider rice as a means of increasing cash income and not just as a subsistence crop.

MAIN SOURCES OF INFORMATION

FAO. 1986. *Liberia, report of an agricultural sector review mission*. Report 85/86 CP-LIR.8

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