

COLOMBIA



Source: esri

General

Colombia, officially the Republic of Colombia, is a sovereign state largely situated in the northwest of South America, with territories in Central America. Colombia shares a border in the Northwest with Panama, in the East with Venezuela and Brazil and in the South with Ecuador and Peru. It shares its maritime limits with Costa Rica, Nicaragua, Honduras, Jamaica, Haiti and the Dominican Republic. The country has an area of 114 Mha (million hectares) with in 2022 a population of 51.9 million, or 0.46 persons per ha (Wikipedia and United Nations, 2022).

Climate and geography

The climate of Colombia is characterized by being tropical, presenting variations within six natural regions and depending on the altitude, temperature, humidity, winds and rainfall. The diversity of climate zones in Colombia is characterized by having tropical rainforests, savannas, steppes, deserts and mountain climate. Below 1,000 metres is the warm altitudinal zone, where temperatures are above 24 °C. About 82.5% of the country's total area lies in the warm altitudinal zone (source: Wikipedia).

East of the Andes lies the savanna of the *Llanos*, part of the Orinoco River basin, and in the far southeast, the jungle of the Amazon rainforest. Together these lowlands comprise over half Colombia's territory, but they contain less than 6% of the population. In the north the Caribbean coast, home to 21.9% of the population and the location of the major port cities of Barranquilla and Cartagena, generally consists of low-lying plains. By contrast the narrow and discontinuous Pacific coastal lowlands are sparsely populated and covered in dense vegetation.

Part of the Ring of Fire, a region of the world subject to earthquakes and volcanic eruptions, in the interior of Colombia the Andes are the prevailing geographical feature. Most of Colombia's population centres are located in these interior highlands.

Colombia is the sixth country in the world by magnitude of total renewable freshwater supply and has still large reserves of freshwater. The main rivers of Colombia are Magdalena, Cauca, Guaviare, Atrato, Meta, Putumayo and Caquetá. Colombia has four main drainage systems: the Pacific drain, the Caribbean drain, the Orinoco Basin and the Amazon Basin. The Orinoco and Amazon rivers mark limits with Colombia to Venezuela and Peru respectively.

Urrutia (2006) describes that in 1973 the Agustín Codazzi Geography Institute (IGAC) has carried out a soil study for Colombia. Two soil types were distinguished. The type-A soils correspond to the soil classes I, II and III and are suitable for mechanization, intensive agriculture and livestock and for the development of irrigated agriculture. These soils are mainly located in the Caribbean plains and in the Orinoco and Amazon river regions. Most of the type-B soils correspond to class IV, about 4.4 Mha. For these soils the ground surface varies from flat to concave flat. For agricultural use they require, among others, land improvement like flood protection, drainage and leaching. In this category polders, or potential polder areas may be expected.

Existing polders

Most of the reclaimed areas in the Rio Magdalena Delta have been impoldered by farmers, generally by constructing small bunds on the levees to protect the low-lying areas against flooding. A number of pilot polders have been established to gain experience before major reclamation schemes were undertaken. Three existing polders have been identified, these are (Group Polder Development, 1982; Otero, 2002; Depeweg and Otero, 2004): RUT Irrigation District, Canal del Digue and polders of Mompòs.

RUT Irrigation District

The RUT Irrigation District is located in the southwest of Colombia, between the western mountain range and the Cauca River in the Valle del Cauca Department. The polder has a gross area of about 10,000 ha. It is a flat polder area with an infrastructure for irrigation, drainage and flood protection. A dike and a flood interceptor canal enclose the area, while a main drain divides the area almost in half, running from South to North through the lowest elevations. The dike runs for 44 km along the left bank of the river and protects the area against floods from the Cauca River. The interceptor canal is 30.4 km long and runs along the west side of the area. The canal protects the area against floods from small rivers coming from the western mountain range; it also supplies irrigation water to some areas in the western parts. Figure 1 shows the schematic lay out of the area and Figure 2 the principle cross-section. Excess water is pumped out of the area, mainly during the wet season and is pumped in for irrigation during the two growing seasons. The supplementary irrigation is based on the rainfall deficit, but a distinct criterion to supply water according to daily rainfall and cropping calendar does not exist. Hence, it is possible that more water than required is supplied to the area, affecting not only the pumping costs for irrigation but also for drainage. The main drain, which is 26 km long and divides the area almost in half, discharges through a flap gate in the Cauca River during low stages and the excess water is pumped out during high river stages at the Cayetana ($5.1 \text{ m}^3/\text{s}$) and/or Candelaria ($2.8 \text{ m}^3/\text{s}$) pumping stations (Figure 1). This implies a discharge capacity for the drainage system of at least $7.9 \text{ m}^3/\text{s}$ or $6.8 \text{ mm}/\text{day}$ (Otero, 2002; Depeweg and Otero, 2004).

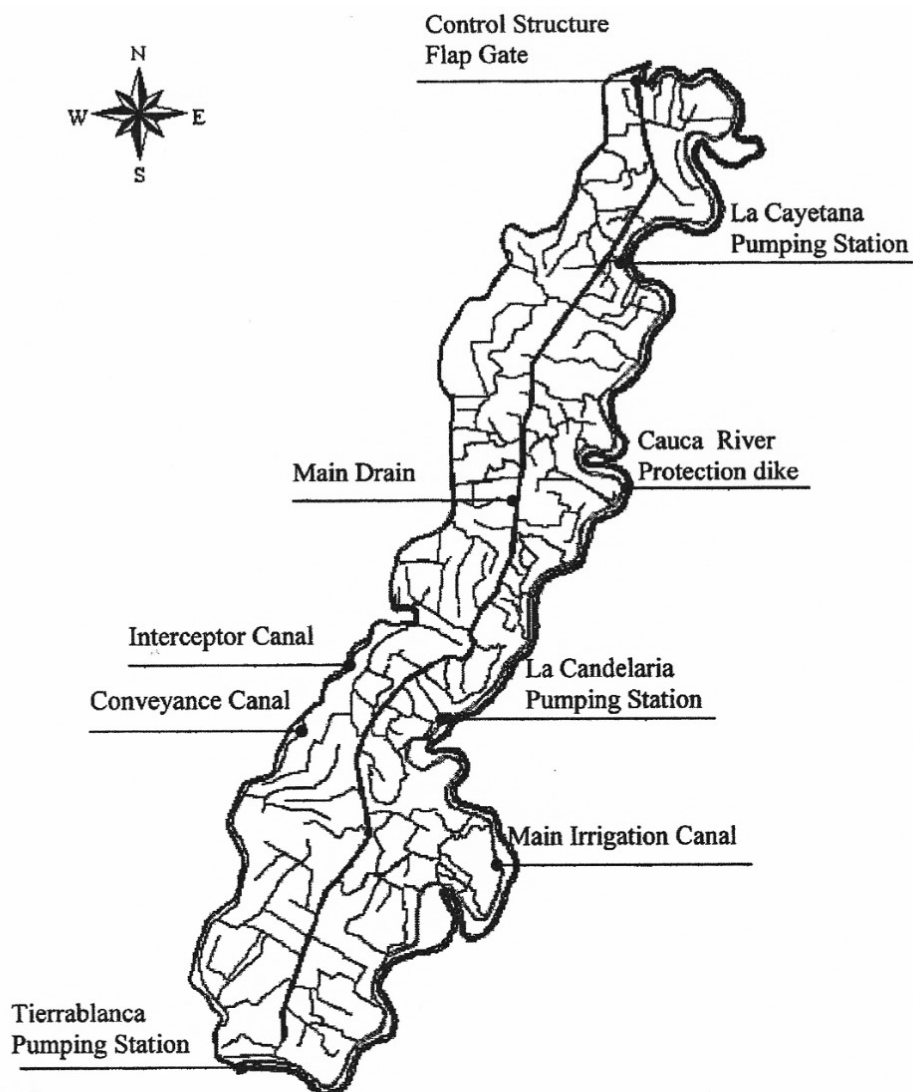


Figure 1. Schematic lay out of the RUT Irrigation District (Depeweg and Otero, 2004)

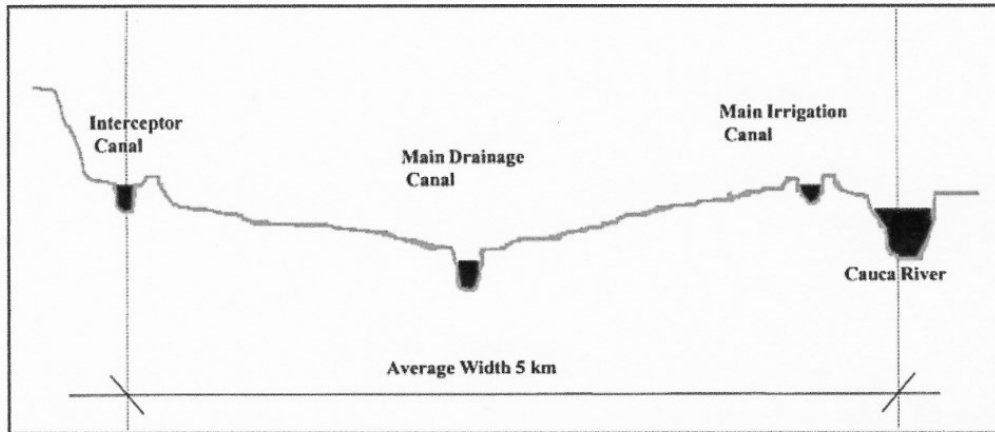


Figure 2. Principle cross-section of the RUT Irrigation District (Depeweg and Otero, 2004)

Canal del Dique

Canal del Dique is an area of about 2,000 ha, located in the Western part of Colombia. The area is drained by means of a pumping station.

Polders of Mompòs

The polders of Mompòs are small polders located along the Rio Magdalena in the area of the Delta that is subject to subsidence (Group Polder Development, 1982).

Proposed polders

A large area with potential for reclamation can be found in the Rio Magdalena Delta (Group Polder Development, 1982).

Location of the polders in Colombia as shown on the World polder map

The location of the polders in Colombia is shown in Figure 3.



Figure 3. Location of the polders in Colombia (source: esri – Batavialand)

Table III shows the pictures by Prof. Adriaan Volker and Table IV shows the pictures by Prof. Bart Schultz.

References

- Agustin Codazzi Geography Institute (IGAC), 1973. *Inventario de suelos por clases agrológicas*. Bogotá, Colombia (in Spanish).
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- Urrutia Cobo, Norberto, 2006. *Sustainable management after irrigation system transfer. Experiences in Colombia – The RUT Irrigation District*. PhD thesis UNESCO-IHE/Wageningen University. Delft, the Netherlands.

Bart Schultz

Lelystad, April 2023

Table I. General characteristics of existing polders in Colombia

Name	Reclamation	Area in ha	Type *)	Latitudes	Longitudes	Elevation in m+MSL	Land use
RUT Irrigation District	1964-1970	10,000	RLL	4° 31' N	76° 04' W	907	Agriculture
Canal del Dique		2000	RLL	10° 18' N	75° 11' W	7	Agriculture
Polders of Mompòs			RLL	9° 15' N	74° 25' W	17	Agriculture
Total		12,000					

*) RLL = reclaimed low-lying land; LGS = land gained on the sea; DL = drained lake

Table II. Characteristics of the water management and flood protection system of existing polders in Colombia

Name	Design criteria in chance of occurrence/year					
	Water management					Flood protection
	Drainage				Irrigation	Rural
	Type	Design criterion	Percentage of open water	Discharge capacity		
			m ³ /s	mm/day		
RUT Irrigation District	RLL			7.9	6.8	Yes, total capacity of three pumping stations 14.7 m ³ /s
Canal del Dique	RLL					
Polders of Mompòs	RLL					

Table III. Pictures on polders in Colombia by Prof. Adriaan Volker












			
<p>A5 001/II.5.1 Presumably aerial photo of the Rio Magdalena Delta, November 1975</p>	<p>A5 001A/II.5.1A Prof. Adriaan Volker studies map at the airport, November 1975</p>	<p>A5 002/II.5.2 Presumably flooding from the Rio Magdalena, November 1975</p>	<p>A5 003/II.5.3 Presumably flooding from the Rio Magdalena, November 1975</p>
			
<p>A5 004/II.5.4 Presumably flooding from the Rio Magdalena, November 1975</p>	<p>A5 005/II.5.5 Presumably flooding from the Rio Magdalena, November 1975</p>	<p>A3 4 076/A.3.4.76 Flooding</p>	<p>A3 4 077/A.3.4.77 Flooding</p>
			
<p>A3 4 078/A.3.4.78 Flooding</p>	<p>A3 4 079/A.3.4.79 Flooding</p>	<p>A3 4 080/A.3.4.80 Flooding</p>	<p>A3 6 043/A.3.6.43 Aerial picture lowland area</p>

Table III. Pictures on polders in Colombia by Prof. Adriaan Volker (continued)

			
A3 6 044/A.3.6.44 Aerial picture lowland area	A3 6 045/A.3.6.45 Aerial picture lowland area	A3 6 046/A.3.6.46 Aerial picture lowland area	A3 6 047/A.3.6.47 Aerial picture lowland area
			
A3 6 048/A.3.6.48 Aerial picture lowland area	A3 6 049/A.3.6.49 Aerial picture lowland area	A3 6 050/A.3.6.50 Aerial picture lowland area	A3 6 051/A.3.6.51 Aerial picture lowland area
			
A3 6 052/A.3.6.52 Aerial picture lowland area	A3 6 053/A.3.6.53 Aerial picture lowland area	A3 6 054/A.3.6.54 Aerial picture lowland area	A3 6 055/A.3.6.55 Aerial picture lowland area

Table III. Pictures on polders in Colombia by Prof. Adriaan Volker (continued)






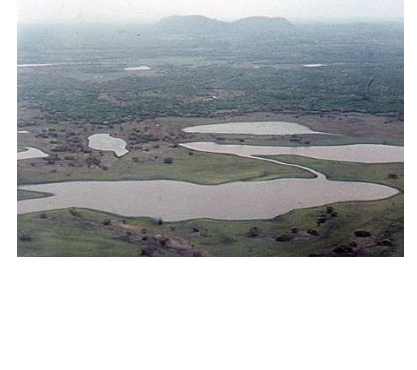





			
<p>A3 6 056/A.3.6.56 Aerial picture lowland area</p>	<p>A3 6 057/A.3.6.57 Aerial picture lowland area</p>	<p>A3 6 058/A.3.6.58 Aerial picture lowland area</p>	<p>A3 6 059/A.3.6.59 Aerial picture lowland area</p>
			
<p>A3 6 060/A.3.6.60 Aerial picture lowland area</p>	<p>A3 6 061/A.3.6.61 Aerial picture lowland area</p>	<p>A3 6 062/A.3.6.62 Aerial picture lowland area</p>	<p>A3 6 063/A.3.6.63 Aerial picture lowland area</p>
			
<p>A3 6 064/A.3.6.64 Aerial picture lowland area</p>			

Table IV. Pictures of polders in Colombia by Prof. Bart Schultz

			
Rij 5 001/XVIII/5-1 Irrigation canal with a movable weir and full of water hyacinths in the RUT Irrigation District, February 2002	Rij 5 002/XVIII/5-2 Irrigation canal with a movable weir and full of water hyacinths in the RUT Irrigation District, February 2002	Rij 5 003/XVIII/5-3 Parcel ditch and local road in the RUT Irrigation District, February 2002	Rij 6 001/XVIII/6-1 Meadows in the RUT Irrigation District, February 2002
			
Rij 6 002/XVIII/6-2 Dike and meadows in the RUT Irrigation District, February 2002	Rij 7 001/XVIII/7-1 Meadows in the RUT Irrigation District, February 2002	Rij 7 002/XVIII/7-2 Maizefields in the RUT Irrigation District, February 2002	Rij 7 003/XVIII/7-3 Maizefields and bananas in the RUT Irrigation District, February 2002
			
Rij 7 004/XVIII/7-4 Sugar cane in the RUT Irrigation District, February 2002	Rij 1 001/XIX/1-1 Sugar cane in the RUT Irrigation District, February 2002	Rij 1 002/XIX/1-2 Group picture. Second from right Norberto Urrutia, phd student of UNESCO-IHE, fourth from right prof. Bart Schultz. With black shirt the director and the others are staff members of the RUT Irrigation District, February 2002	Rij 1 003/XIX/1-3 Group picture. Second from right Norberto Urrutia, phd student of UNESCO-IHE, fourth from right prof. Bart Schultz. With black shirt the director and the others are staff members of the RUT Irrigation District, February 2002

Table IV. Pictures of polders in Colombia by Prof. Bart Schultz (continued)

			
Rij 1 004/XIX/1-4 Removal of the vegetation from one of the canals of the RUT Irrigation District, February 2002	Rij 2 001/XIX/2-1 Removal of the vegetation from one of the canals of the RUT Irrigation District, February 2002	Rij 2 002/XIX/2-2 Removal of the vegetation from one of the canals of the RUT Irrigation District, February 2002	Rij 2 003/XIX/2-3 Removal of the vegetation from one of the canals of the RUT Irrigation District, February 2002
			
Rij 2 004/XIX/2-4 Pumping station for water supply to the RUT Irrigation District, February 2002	Rij 3 001/XIX/3-1 Pumping station for water supply to the RUT Irrigation District, February 2002	Rij 3 002/XIX/3-2 Irrigation canal full with water hyacinths in the RUT Irrigation District, February 2002	Rij 3 003/XIX/3-3 Irrigation canal in the RUT Irrigation District, February 2002
			
Rij 3 004/XIX/3-4 Irrigation canal in het RUT Irrigation District, February 2002			