CAMEROON

Source: esri

General

Cameroon – officially the Republic of Cameroon – is located in Central Africa. It is bordered by Nigeria in the West, Chad in the Northeast, the Central African Republic in the East and Equatorial Guinea, Gabon and the Republic of the Congo in the South. The country has an area of 47.5 Mha (million hectares) with in 2022 a population of 27.9 million, or 0.56 persons per ha (Wikipedia and United Nations, 2022)

Climate and geography

Cameroon is divided into five major geographic zones distinguished by dominant climatic, physical and vegetative features. The coastal plain is hot and humid with a short dry season and includes some of the wettest places on earth. The South Cameroon Plateau has an alternation between wet and dry seasons, which makes it less humid than the coast. An irregular chain of mountains, hills, and plateaus known as the Cameroon range extends from Mount Cameroon on the coast almost to Lake Chad at Cameroon's northern border. This region has a mild climate, although rainfall is high. The southern plateau is an arid region with sparse rainfall and high temperatures (source: Wikipedia).

The coastal plain extends 15 to 150 km inland from the Gulf of Guinea and has an average elevation of 90 m+MSL (mean sea level). It is densely forested. The South Cameroon Plateau rises from the coastal plain to an average elevation of 650 m+MSL. The southern plateau rises northward to the grassy, rugged Adamawa Plateau. This feature stretches from the western mountain area and forms a barrier between the country's North and South. The northern lowland region extends from the edge of the Adamawa Plateau to Lake Chad with an average elevation of 300 to 350 m+MSL. Its characteristic vegetation is savanna scrub and grass (source: Wikipedia).

Cameroon has four drainage patterns. In the South, the principal rivers are the Ntem, Nyong, Sanaga, and Wouri. These flow southwest ward or westward directly into the Gulf of Guinea. The Dja and Kadéï rivers drain southeast ward into the Congo River. In northern Cameroon, the Bénoué River runs North and West and discharges into the Niger River. The Logone River flows northward into Lake Chad, which Cameroon shares with three neighbouring countries Nigeria, Niger and Chad (Lemoalle and Magrin, 2014).

Lemoalle and Magrin (2014) describe the situation around Lake Chad in the dry North-east corner of the country. They also show the irrigation schemes in the Lake Chad Basin (Figure 1). Part of these schemes in the flood prone areas and around Lake Chad are polders.

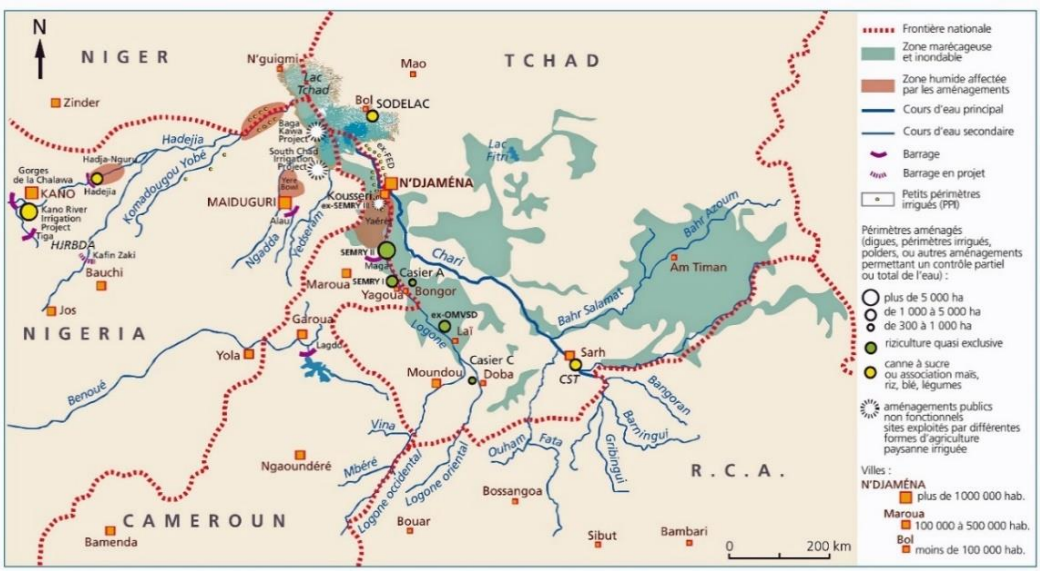

Figure 1. Irrigation schemes in the Lake Chad Basin (Lemoalle and Magrin (2014)

Delclaux *et al*. (2010) describe the *Yaéré* floodplain, located in the Extreme North of Cameroon (Figure 2). This plain is the area where polders in Cameroon have been identified.

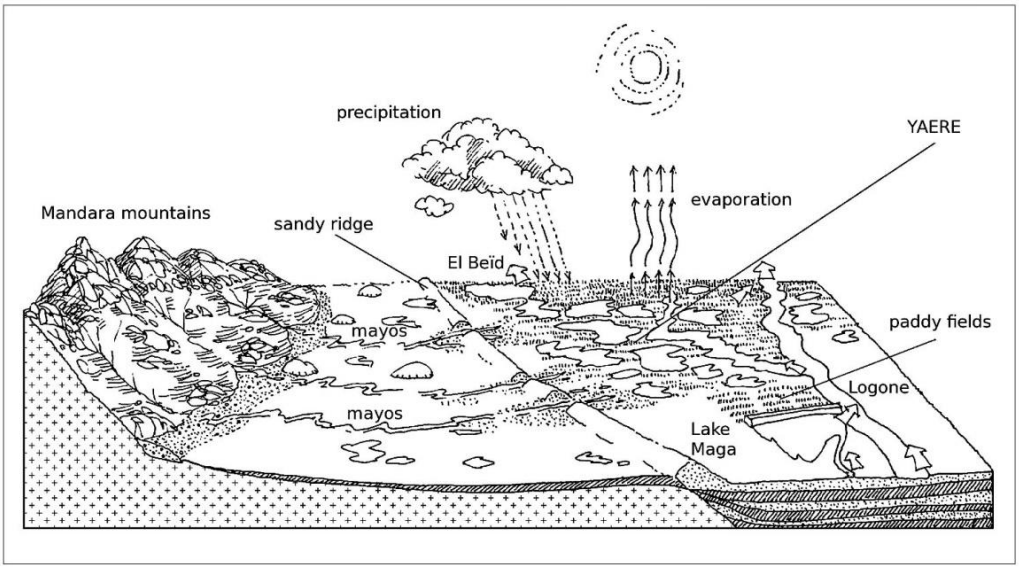

Figure 2. Schematic drawing of the Yaéré floodplain and related water fluxes (Delclaux et al., 2010)

Delclaux *et al*. (2010) also describe the original hydrological situation in the area. At the end of the dry season (April), the clays that form an essential part of the soils of the plain are cracked until a depth of a metre. At the beginning of the rainy season, they swell up and become impermeable. Hence, except at the very local places where limited extension sand lenses exist recharge of the aquifer by superficial water is slow. If the rains are abundant, the ponds fill up and form the first flooding in the depressions. The contributions of the water courses from the Mandara Mountains, heavily laden with suspended matter, arrive afterwards. Thereafter, overflow of the Logone River could enter into the plain through the main floodway, the Logomatia, parallel to the Logone River (Figure 2). These contributions were facilitated by the presence of numerous fishing channels that were dug across their banks. These overflows, which brought the largest amount of water, general started from the beginning of September. The inundation could reach up to 2 metres, and covered part of the plain for three or four months. During this period, which corresponded to the beginning of the dry season, evaporation from the water crossing the plain occurred. If the volumes of water from the Logone River were large enough, the water remaining after evaporation would flow into Lake Chad through the main outlet in the North-West of the plain, El Beïd at Tildé. Delclaux *et al*. (2010) also present an elevation map of *Yaéré* floodplain (Figure 3).

Loth (2004) describes that in 1954, a rice company, called *Société d'expansion et de Modernisation de la Riziculture de Yagoua* (SEMRY) was created to promote the local rice production in the Logone floodplain and to organise the rice marketing activities. He also describes that in 1957 dikes along the Logone River south of Pouss were constructed to protect the SEMRY I Scheme against flooding. However, the major problem remained the inability to control the flooding by the Logone River. Within the framework of the second Development Plan of Cameroon (1966-1971), the government ordered a feasibility study on an intensification of the SEMRY activities. Among others, this intensification programme would include the construction of dikes to stop flooding by the Logone River and controlled irrigation of rice plots by pumps. Based on the results of the feasibility study the SEMRY I project was implemented in Yagoua from 1971-1977 (Figure 4) (World Bank, 1984).

The impact of the SEMRY I Scheme on the organisation of production and consumption at the intra-household level has been described by Jones (1983). Loth (2004) describes that, given the success of the SEMRY I project, the government decided to expand the intensification programme to other favourable areas of the Logone floodplain and that location studies conducted in 1976 led to the creation of two other SEMRY schemes in Maga (SEMRY II in 1977), 70 km downstream of the SEMRY I Rice Scheme, and in Kousseri (SEMRY III in 1978) (Figure 5). Details of the SEMRY Rice schemes are shown in Figure 6 (Seignobos and Iyébi-Mandjek, 2005).

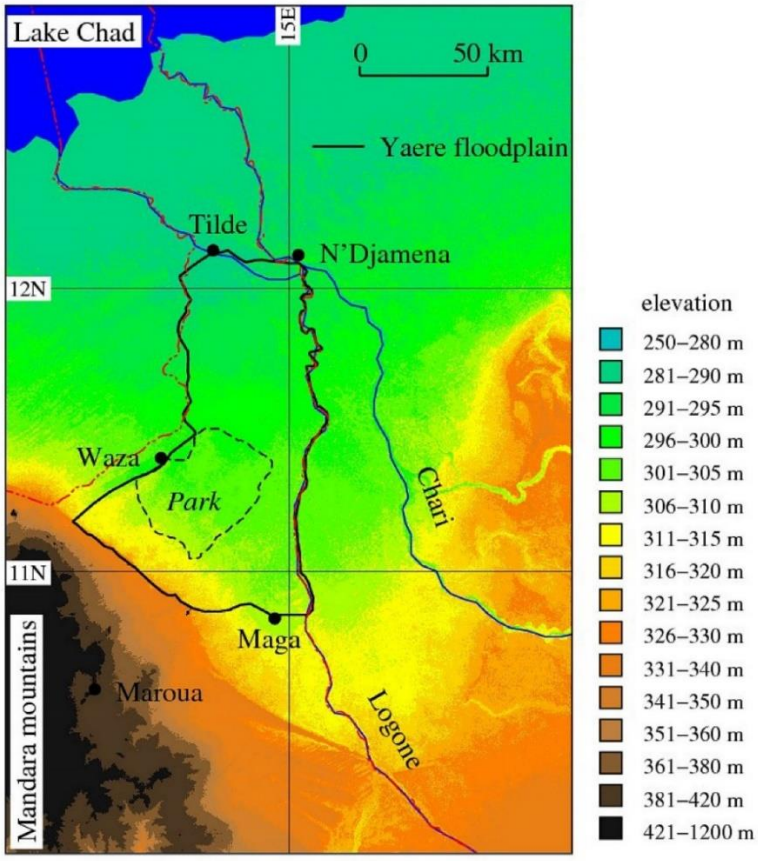

Figure 3. Elevation map of Yaéré floodplain, based on data from the DEM SRTM 3'' (Delclaux et al., 2010)

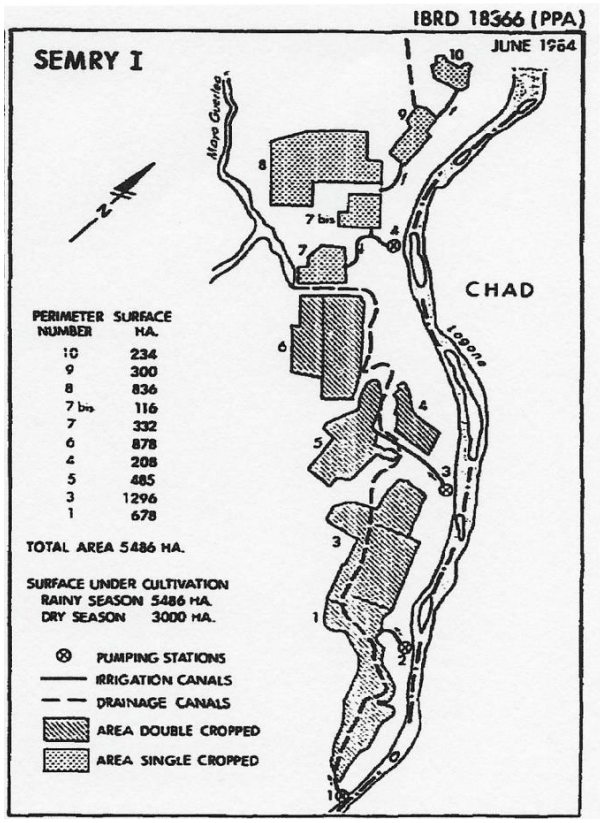

Figure 4. SEMRY I Rice Scheme in the Extreme North of Cameroon, implemented in the period 1971 -1977 (World Bank, 1984)

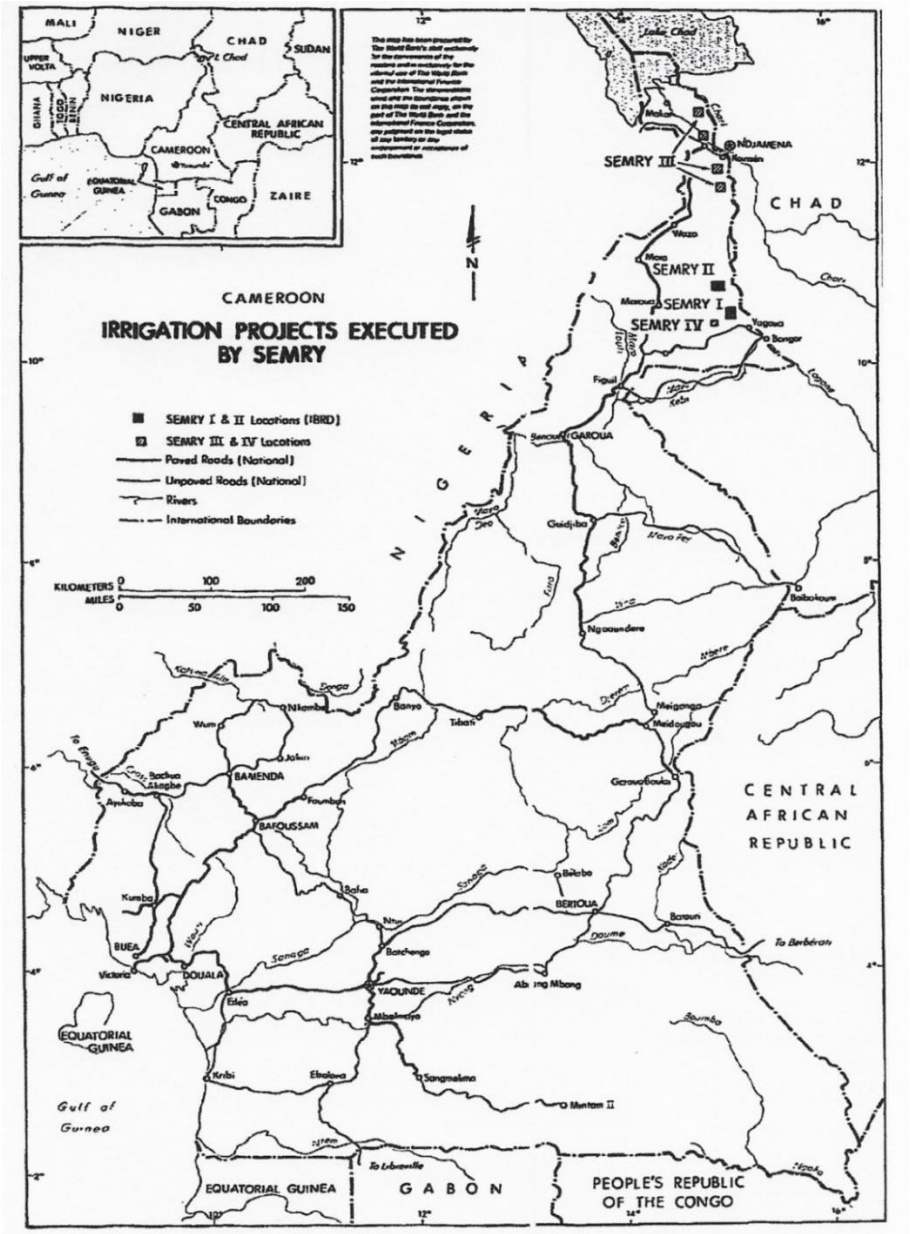

Figure 5. Map of Cameroon with the four SEMRY rice schemes in the Extreme North of Cameroon (World Bank, 1984)

To avoid the costs of irrigation by pumps the government decided to build a dam in order to create Lake Maga. The lake covers an area of 36,000 ha. Between 1979 and 1981 the 27 km long and 3.5 m wide at the crest earthen dam was built across the Logone floodplain (Figure 7). This dam is equipped with a spillway and 4 intakes to irrigate the 7,000 ha rice paddies of the SEMRY II Scheme with complete control of the water downstream (Delclaux *et al*., 2010). The spillway discharges excess water to the plain when the lake is full. During periods of exploitation, the excess water drained from the rice paddies is directed towards the plain as well. The Maga Dam was linked upstream with building a dike on the banks of the Logone River. In effect, with a view to protecting the river people and the rice paddies along the river, construction of the dike was undertaken between 1950 and 1970 on both sides of the Logone River, over some 50 km upstream of Bongor, in order to control the spates of the river. This work was continued up to 1979 when it was completed on the Cameroon side, by the construction of the Maga Dam and the 20 final kilometres of the dike along the Logone River between Pouss and Tékélé, during implementation of the SEMRY II project. This brought the total length of the dike along the left bank of the Logone River to 100 km from Yagoua to Tekele, upstream and downstream of Pouss (World Bank and Lake Chad Basin Commission, 2002; Delclaux *et al*., 2010).

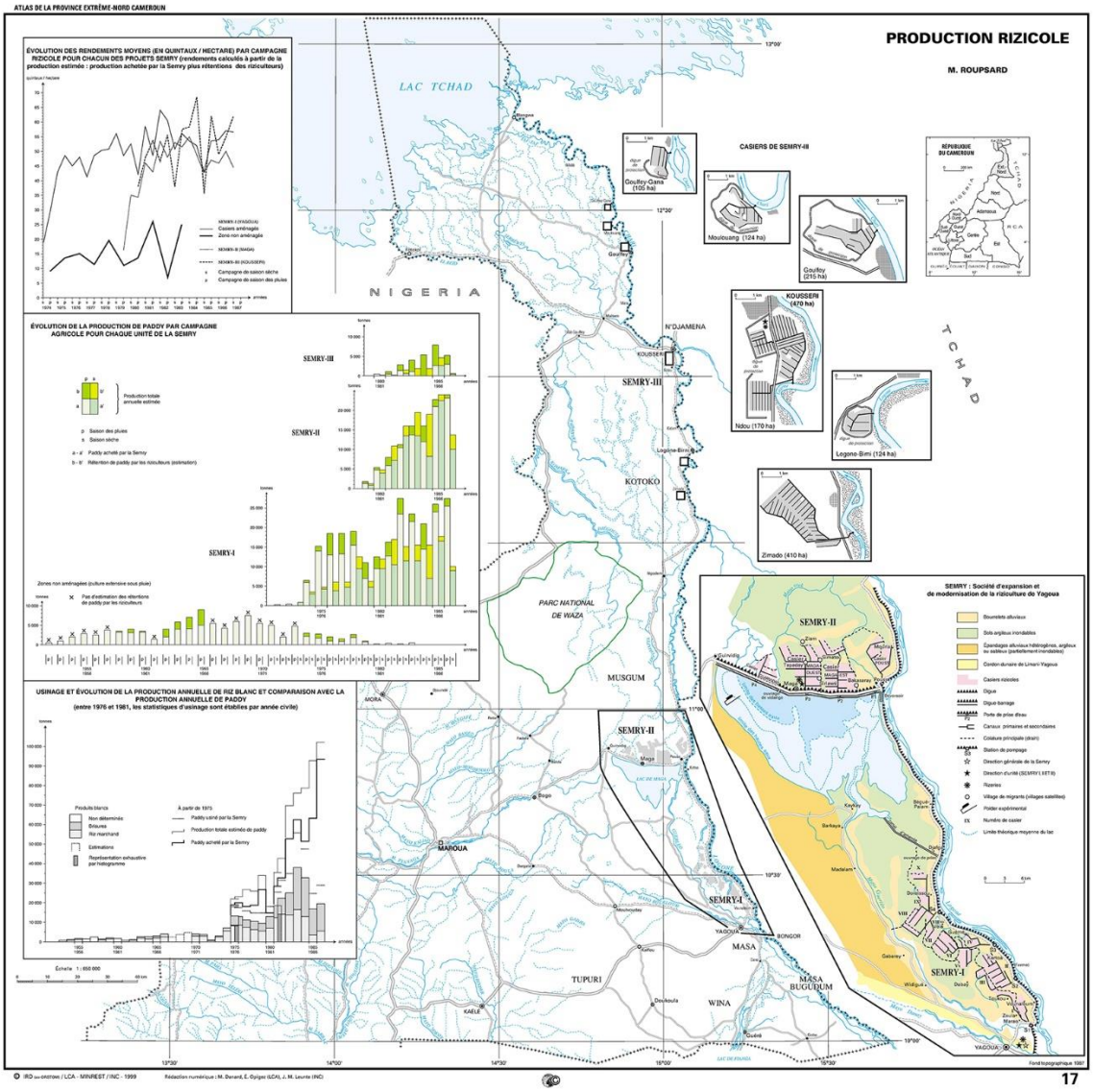

Figure 6. Details of the SEMRY Rice schemes (Seignobos and Iyébi-Mandjek, 2005)

Figure 7. Lake Maga and the dam serving the SEMRY II Scheme (source: Google Earth)

In the Appraisal report of the World Bank (1977) for the SEMRY II Rice Project it is described that flood waters were drained from the project area through the Mayo Guerleo River in the South, the Mayo Pouss River in the centre, and the Mayo Areinata, Mayo Vrik as well as the small and large Mayo Goroma rivers in the North. The rehabilitated Logone dike would block flow from the river into the Mayos Pouss, Areinata and small Goroma rivers. All drainage therefore would take place through the Mayo Vrik and the large Goroma rivers, which eventually join the Logone River at Logone Birni farther to the North.

Delclaux *et al*. (2010) describe that the poor sales of SEMRY rice challenged by Asian rice imports led to the abandonment of double harvesting in 1988. Following the withdrawal of the government, responsibility was transferred to groups of rice farmers, which, added with interventions by local traders who were poorly equipped, did not bring the expected results. In spite of the liberalization of the rice market in 1991 and successive restructuring, the SEMRY struggled to emerge from this stagnation.

Loth (2004) describes that the Maga Dam has had a very negative impact on the conditions in the floodplain downstream of the dam, while the regular flooding did not occur anymore. He describes a project to restore to a certain extent the regular flooding. However, this only concerned the areas outside the SEMRY schemes that remained protected against flooding.

Loth (2004) and Delclaux *et al*. (2010) describe that in 1994 a pilot re-flooding experiment was started by opening the dike of the Logone River opposite Petit Goroma, one of the tributaries of the Logomatia, which in July 1994 supplied 20 m^3/s to the *Yaéré*. This partial restoration of the flooding was favourably received by the inhabitants, which led in 1997 to the supplementary opening of the Areitekele mayo, another tributary of the Logomatia to provide a supplement of up to 10 m^3/s. After the study of the impact on the inhabitants and simulations with a hydrological model (Evens *et al*., 2003; Cameroon Association for Environmental Education (ACEEN), 2007), the configuration of 1997 was considered to be satisfactory for all parties and was retained. However, Delclaux *et al*. (2010) state that in 2009, the polemic over the consequences of the Maga dam on the water supply to the *Yaéré* was still not over.

The SEMRY polder areas are a special type of polders, which is called the horse shoe type. These areas are protected low-lying lands by dikes against flooding from the river and provided with a drainage system. However they have a free outlet at the downstream side, due to the gradient in the floodplain (Figures 3 and 6).

Existing polders

In a report by the World Bank (1978) an audit on the SEMRY I Scheme (Figure 4) is presented. In Annex A of the report on project design and physical implementation reference is made of:

- reinforcement of the 49 km long Logone Dike;
- construction of a 32 km long open main drain;
- rehabilitation of existing irrigation and drainage networks at respectively 1,300 and 3,000 ha.

In addition reference is made that the final rehabilitation works covered 4,500 ha, while also reference is made of an additional polder of about 800 ha that is called the Gabareye Polder (no. 8 in Figure 4). From this report it can therefore be derived that the total area of SEMRY I polder area is at least 5,300 ha. In the World Bank (1978) report also reference is made of the SEMRY II project, among others including the construction of additional dikes along Logone River (48 km in total) to protect 15,000 ha, irrigation at 7,000 ha and rainfed cultivation at 8,000 ha. This was approved by the World Bank on February 1, 1978.

In another report by the World Bank (1984) an audit on the SEMRY II Rice Project is presented (Figure 5). In this report also reference is made to the SEMRY III Project of in total 1,148 ha in several small schemes (Figure 6). From a map in this report as well as by relating it to Google Earth it can be derived that there has been a SEMRY IV Scheme (Figure 6). However, information on this Scheme could not be found, and it is not shown in the Atlas (Seignobos and Iyébi-Mandjek, 2005).

General characteristics of the polders in Cameroon are shown in Table I. Characteristics of the water management and flood protection systems are as far as available shown in Table II.

Proposed polders

No proposed polders could be identified.

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

The location of the polders in the north of Cameroon is shown in Figure 8.

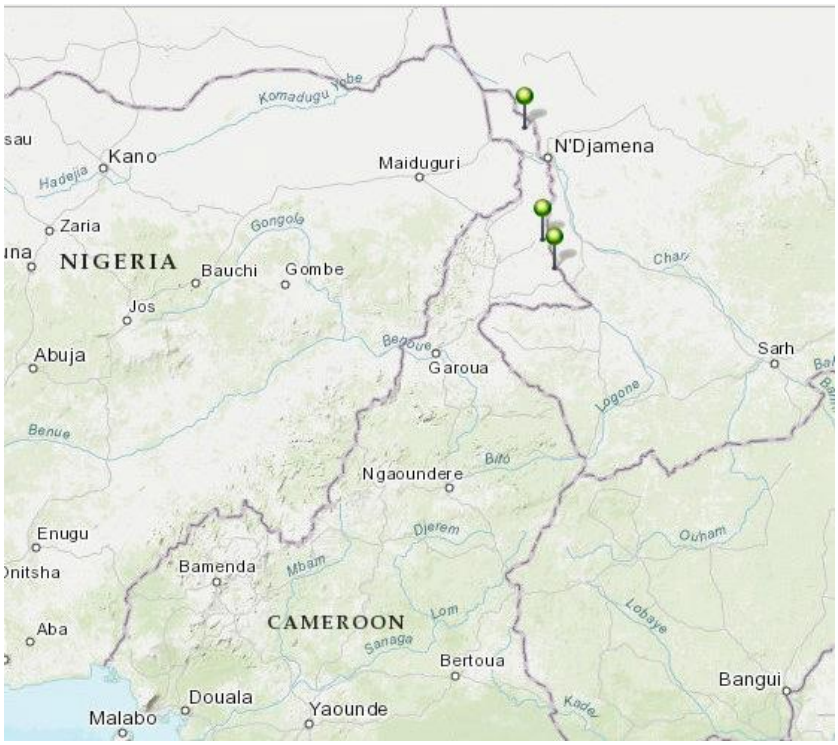

Figure 8. Location of the polders in the North of Cameroon (source: esri – Batavialand)

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Table I. General characteristics of polders in Cameroon

Name	Reclamation	Area in ha	Type *)	Latitudes	Longitudes	Elevation in m+MSL	Land use
SEMRY I Rice Scheme consisting of 10 polders (Figure 4):	1971-1977		RLL				Rice cultivation
* 1		675		10º 35’ N	15º 08’ E	317	
* 3		1,296					
* 4		205					
* 5		485					
* 6		878					
* 7		332					
* 7bis		116					
* 8 Gabareye Polder		836					
* 9		300					
* 10		234		10º 24’ N	15º 16’ E	322	
Total		5,363					
SEMRY II Rice Scheme	1977	6,300	RLL	10º 51’ N	14º 58’ E	313	Rice and Mouskouari (Sorghum)
SEMRY III Rice Scheme consisting of 6 polders (Figure 6):	1978		RLL				Rice cultivation
* Goulfey-Gana		105		12º 24’ N	14º 53’ E	293	
* Moulouang		124					
* Goulfey		215					
* Kousseri		670					
* Logono-Bimi		124					
* Zimando		410		11º 41’ N	15º 03’ E	300	
Total		1,648					
SEMRY IV Rice Scheme			RLL				
Total		13,311					

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

Table II. Characteristics of the water management and flood protection systems of the polders in Cameroon

Name	Design criteria in chance of occurrence/year						
	Water management						Flood protection chance/year
	Drainage					Irrigation	Rural
	Type	Design criterion	Percentage of open water	Discharge capacity			
				m^3/s	mm/day		
Maga Dam							1/10,000
Dike along Logone River							
SEMRY I Rice Scheme	RLL						
SEMRY-II Rice Scheme	RLL						
SEMRY III Rice Scheme	RLL						
SEMRY-IV Rice Scheme	RLL						