Rwanda

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Location and area

Rwanda is a republic in east-central Africa, bordered on the north by Uganda, on the east by Tanzania, on the south by Burundi, and on the west by Lake Kivu and the Democratic Republic of the Congo (formerly Zaïre). The area of Rwanda is 26,338 km^2. (Microsoft Encarta Encyclopedia 2002).

Topography

The central portion of Rwanda is dominated by a hilly plateau averaging about 1,700 m in elevation. Eastwards, towards the Tanzanian border, the land slopes downwards to a series of marshy lakes along the upper Kagera River. On the western side of the plateau is a mountain system averaging about 2,750 m in elevation, forming the watershed between the Nile and Congo river systems. The northern reaches of these mountains contain the Virunga chain of volcanoes, which includes Karisimbi (4,507 m), the highest peak. West of the mountains the elevation drops to about 1,450 m in the Lake Kivu region. (Microsoft Encarta Encyclopedia 2002).

Climate

Rwanda has three main seasons. A short dry season occurs in January. The major rainy season lasts from February to the end of May, then June to late September is characterized by dry weather. The average yearly rainfall is 787 mm and is heaviest in the western and north-western mountain regions. Wide temperature variations occur because of differences in altitude. The average daily temperature in the Lake Kivu area is 23° C. In the mountains in the northwest frost occurs at night. (Microsoft Encarta Encyclopedia 2002).

Land use

Forests, once extensive, are now concentrated in the western mountains and Lake Kivu area. The population of Rwanda is 94 % rural. Most of the people live throughout the mountainous regions. The main exception to this was the Virunga volcanic region with infertile soils. Rwanda has essentially a subsistence economy dependent on the export of one main commodity, coffee. Overgrazing is an important problem. Virtually all electricity is generated by hydroelectric facilities (Microsoft Encarta Encyclopedia 2002).

Wetlands

Of the total land area (26,338 km^2), 1,650 km^2 are covered by wetlands (Kanyarukiga & Ngarambe 1998). Table 1 summarizes the areas of the wetlands.

Table 1: Surface areas (ha) of wetlands in Rwanda by Prefecture (from Kanyarukiga & Ngarambe 1998).

Prefecture	Wetland area of smaller networks		Wetland area of primary networks		Total wetland area	
	Total area	Cultivated	Total area	Cultivated	Total area	Cultivated
Butare	18,813	17,380	5,757	1,346	24,570	18,726
Byumba	25,993	12,856	1,830	109	27,823	12,965
Cyangugu	4,324	4,134	3,117	3,117	7,441	7,251
Gikongoro	8,304	8,111	1,394	1,228	9,698	9,339
Gisenyi	1,235	1,225	402	402	1,637,	1,627
Gitarama	11,920	11,818	4,810	2,202	16,730	14,020
Kibungo	15,900	7,616	16,376	45	32,276	7,661
Kibuye	891	880	104	104	995	984
Kigalu	16,052	10,022	18,060	4,910	34,122	14,932
Ruhengeri	8,429	5,041	1,226	1,208	9,655	6,249
Total	111,871	79,083	53,076	14,671	164,947	93,754

Table 2 and 3 present two types of wetland typologies for Rwanda.

Table 2: Typology of marhlands according to Cambrezy (1981)

Type	**Classification**	**Localisation**	**Area (estimate) in km^2**
I	Big swampy valleys	Eastern region	500
II	Mountain marshes	Eastern and Northern region	300
III	Small marshlands	Central and Southern region	450
nc	Marshland on the shores of Lake Kivu and Bugarama	Lake Kivu Region and the Plain of Bugarama	Included in type II

Table 3: Types of wetlands according to their natural vegetation (after Kanyarukiga & Ngarambe 1998).

Type	**Vegetation**	**Remarks**	**Water conditions**
Papyraie	Abundant and nearly exclusive *Cyperus papyrus*		Stagnant water over the surface
Marshland with *Cyperus latifolius*	*Cyperus latifolius*	Almost completely cultivated in the dry season	Water levels fluctuating by some centimeters to below the soil surface
Spongy valley	Shrubs with an undergrowth of ferns and tall grasses	The river is covered by thick grass	Water level in valley always remains below the surface
Valley for grazing (pastures):		Rivers meander through narrow valleys with small plains	Valley doesn't become flooded

In the area of plateaus and hills (1,400m to 2,000 m altitude), the highest density of small marshlands are found (Jones & Egil 1984), many of them with organic soils, which are fairly

to very acid and relatively poor in exchangeable bases. In the high altitude areas (more than 2,000 m), peat predominates over mineral soils and all the soils are in general acid and very poor in exchangeable bases (Kanyarukiga & Ngarambe 1998).

Peatlands

The exact extent of peatlands and volume of peat deposits of Rwanda still remain unknown. Deuse (1966, cited in Bord na Mona 1985) estimated the total peat reserves in Rwanda and Burundi at 3 10^9 m^3, a figure quoted by Markov et al. (1988). Perhaps more than 50% was estimated to be in Rwanda, in view of the estimated 0.5 10^9 m^3 in the Rugezi valley alone. These estimates, however, have been shown to be excessively optimistic (UNDP/Worldbank 1982). Some *Papyrus* marshes, thought to contain considerable volumes of peat, appeared to have a 0.5 m thick floating vegetation mat on water, with only a thin layer of peat – 0.7 m – lying on the bottom (Martin 1978, cited in Bord na Mona 1985). Martin (1978) also presented a map of peatland areas in Rwanda. The largest peatlands are found in the Akanyaru River Basin in south central Rwanda, bordering Burundi.

Kivinen & Pakarinen (1981) mention the presence of peatland in Rwanda but present no estimates for its area.

Based on information of the Ministery of Natural Resource, Bord na Mona (1985) estimates the area of "peatlands" on 800 km^2. This figure is the source of all later figures. Shrier (1985) uses that figure for "mire area" and " peat resources" and mentions a peat depth range of 3-20 m, with major deposits occurring along the River Akanyaru in the south and in the Rugezi Valley in the north. The same figure of 800 km^2 is used by Andriesse (1988) for the extent of organic soils, and by Schneider & Schneider (1990) and Pfadenhauer et al. (1993) for the peatland area.
Markov et al. (1988) mention the presence of peatlands at the rivers Kagera and Akanyaru and at the border with Tanzania. Furthermore they refer to the German expert W. Heinz, who investigated 89 peatlands in Rwanda in 1968. Peat layer: in one case 1,2 m – 4,3 in another case up to 6 m
Also Pajunen (1994) estimates the "peatland" area in Rwanda to be 800 km^2, and specifies their location to the valleys of the Rivers Akanyaru, Nyabarongo, and Kagera, but also to the margins of the Virunga volcanic range in the western Rift Valley. In the southern part of Akanyaru valley he reports over 20 m of peat, whereas the "mires" in the Kagera valley are said not to produce peat.

Pajunen (1996c) again quotes the 800 km^2 for the estimated peatland area, referring to Bord na Mona (1984). He specifies this area for part of Akanyaru mire (136 km^2), Nyabarongo valley (267 km^2), Kagera valley (300 km^2) and a on-specified area in the Akagera National Park, and in some smaller peatlands. He estimates the peat resources on 3 Gm^3 (in situ) and on 240 Mt dry matter content.
According to the interpreted World Soil Map (Van Engelen & Huting 2002) 920 km^2 of histosols exist in Rwanda and 1,049 km^2 of gley soils.

Mire and peatland losses

According to Pajunen (1994), the largest wetlands are mainly in their natural state, whereas the smaller ones and the margins of the larger ones are drained for agriculture

Of the 1,650 km^2 of wetlands, about 940 km^2 are used for agriculture. This largely concerns mineral soil wetlands, the remaining large marshlands with peaty or organic soils covered by papyrus are generally not cultivated (Kanyarukiga & Ngarambe 1998).
Faced with the high demographic growth rate and the increasing pressure on hillside lands, the utilization of the marshlands to ensure food security constitutes a priority in Rwanda's policy. Marshlands contain large water reserves, have lower erosion risks, a natural fertility and offer possibilities to populations to work together, which is considered to be a factor that can contribute to national reconciliation. Therefore the Government, with the assistance of UNDP and FAO, has recently launched the implementation of a pilot project of development and utilization of marshlands. Parallel to this project, the Ministry of Agriculture has obtained aid from the African Development Bank (ADB) for the realization of a National Master Plan for the development of marshlands and for soil conservation (Kanyarukiga & Ngarambe 1998).
Pajunen (1996c) reports on the increased use of peatland for agriculture due to rapid increasing population. In the period 1967 – 1987 the area for rice cultivation increased from 1,1 km^2 to 26.6 km^2 (Nezehose 1990).

Peat extraction for fuel took already place in the colonial period in the Gishoma peatland (4.1 km^2) south of Cyangugu (UNDP/Worldbank 1982). At present the peatland is almost entirely cultivated (Pajunen 1994, 1996d).
Peat extraction has been taking place since 1974 in the Kiguhu peatland (0.46 km^2), near Ruhengeri (used to dry *Pyrethrum* flowers in an adjacent plant). Approximately 5,000 t of peat is produced annually (UNDP/Worldbank 1982, Karega 1992, Pajunen 1996d). In the Busoro peatland in the Akanyaru River Basin, peat extraction started in 1980 and was automatized in 1981 (UNDP/World Bank 1984a, Bord na Mona 1985).

The southeastern parts of the Akanyaru River Basin peatlands are threathened by flooding by the construction of the proposed Rusumo Falls dam (UNDP/World Bank 1984a, Bord na Mona 1985, ICCON 2001).

<u>Still to be checked:</u>
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