

Burundi

Last updated: 30-01-2004

Location and area

Burundi is a landlocked republic in eastern Africa, bordered on the north by Rwanda, on the east and south by Tanzania, and on the west by Lake Tanganyika and the Democratic Republic of the Congo. It has an area of 27,834 km², of which 2,634 km² are occupied by Lake Tanganyika water. (Microsoft Encarta Encyclopedia 2002).

Topography

Burundi is mostly a hilly plateau region with an average elevation of about 1,500 m. Elevations decrease gradually to the east and southeast. The narrow western margin of the country, bordering the Ruzizi River and Lake Tanganyika, lies in the trough of the Rift Valley. The main rivers are the Ruzizi, the Malagarasi, and the Ruvuvu. (Microsoft Encarta Encyclopedia 2002).

Climate

The climate is tropical equatorial, moderated in most places by altitude. The average annual temperature is 21° C on the plateau and 24 in the Rift Valley. The dry season lasts from May to August. Savannah vegetation predominates in most of the country (Microsoft Encarta Encyclopedia 2002).

Land use

In 1993 (before the war) the population had a mean density of 230 persons/km² (Kayengayenge & Ndayegamiye 1998). Firewood and charcoal meet more than 80% of the country's energy needs, and agricultural by-products an estimated 11%. Petroleum products account for 6% and hydropower covers only 1% of the total energy requirements. The high population density is making fuelwood increasingly scarce and puts reforestation in competition for land with agriculture (ESMAP 1992).

Wetlands

In Burundi the area covered by "wetlands" is about 1,120 km² hectares, of which 56% (627 km²) is currently cultivated. (Kayengayenge & Ndayegamiye 1998).

Peatlands

Swamps¹ in the northeastern provinces of Muyinga, Ngozi and Ruyigi comprise 70% of the total swamp area in the country (Kayengayenge & Ndayegamiye 1998). A classification of peatlands in Burundi is presented in Table 1.

¹ A swamp, according to the Burundian approach, is an area with an *organic soil* containing 30-60 % organic matter. *Peat* has an organic matter content of more than 60% dry weight (Kayengayenge & Ndayegamiye 1998).

Table 1: Relations between soil and vegetation in swamps and peat-bogs (after Deuse 1969, cited in Kayengayenge & Ndayegamiye 1998)

soil	swamp			peat			
	Free water	Free water border	Alluvium and gley	Drowned peat	Peat with superficial water slick	Peat periodically inundated	Dry peat
Low and medium altitude	<i>Jusseva</i> <i>Nymphaea</i> <i>Potamogeton</i>	<i>Pycreus mundtii</i> <i>Cyperus nudicaudis</i>	<i>Phragmites</i>	<i>Cladium</i>	<i>Pycreus mundtii</i> <i>Cyperus nudicaudis</i>		
				<i>Typha</i>		<i>Miscanthidium</i>	
				<i>Cyperus papyrus</i>			
				<i>Cyperus latifolius</i>			
	<i>Potamogeton</i>	Jonçale		<i>Miscanthidium</i>	Jonçale with <i>Sphagnum</i>	<i>Xyris Sphagnum</i>	<i>Erica Sphagnum mildbraedii</i>
High altitude						<i>Erica</i> <i>Cyperus denudatus</i>	
					<i>Cyperus denudatus</i>	<i>Syzygium</i> <i>Erica</i>	
					<i>Cyperus papyrus</i>		

Kayengayenge & Ndayegamiye (1998) simplify this classification as follows:

1. Swamps of mostly *Cyperus papyrus*, characterized by high water
2. Swamps of *Cyperus latifolius*, with lower water levels, that are regularly cultivated in dry seasons.
3. Spongy valleys, with shrubs and tall grasses, in which the water level never reaches above the surface.
4. Grazing valleys, in which the water never covers the often very narrow valleys, that are used for grazing during the dry season.

On the basis of a detailed inventory of peat deposits, carried out in 1974 by Ruston Technical Services International for UNIDO, Bord na Mona (1985) estimates the total extent of peatlands in Burundi to be 140 km² with a total peat volume of 200 Mtonnes (residual moisture content 30 %). 85 % of this volume is located in the north of the country along the river Akanyaru, which separates Rwanda and Burundi (the “Grand Marais”), and its tributaries. The remaining consists of numerous small valley peatlands throughout the country at higher altitude. These include Gitanga (> 89 ha of peatland), Nyacijima (> 70 ha of peatland), Gishubi (> 27 ha of peatland), Kashiho, and Kuruyange (> 20 ha) (UNDP/World Bank 1985, Bord na Mona 1985). Further detailed resource survey has been in progress since 1974 without, however, changing the total area assessed.

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

Shrier (1985), referring to Bord na Mona (1984 =1985), uses the figure of 140 km² for the “mire” area and the “peat resources” in Burundi, Andriesse (1988) for the extent of organic soils, Schneider & Schneider (1990) and Pfadenhauer et al. (1993) for the peatland area. Also According to the interpreted World Soil Map (Van Engelen & Huting 2002) 878 km² of histosols exist in Burundi and 1570 km² of gley soils.

Pajunen (1996b) mentions a “peatland” area of 140 km² with peat resources of 1460 Mm³ (110 Mt of total dry matter). According to Pajunen (1996b) the Akanyaru swamp complex covers 123 km² and the Nyamuswaga swamp 13.40 km².

Other potential peatland areas in Burundi include the Upper Kagera River area (shallow lakes and floodplain, 340 km², shared with Rwanda and Tanzania) and the Ruzizi River (floodplain and swamps, shared with Rwanda and the Democratic Republic of Congo) (cf. Howard-Wiliams & Thompson 1985). Thompson (1985) estimates the real extent of reed swamps in Rwanda and Burundi to be approximately 940 km² (cited in Shier 1985). According to Markov et al. (1988) peatlands are located in the southeastern parts of the country.

Proven reserves are some 55 million MT, predominantly situated in the lowland peatlands (see Table 2).

Table 2: Proven peat reserves of Burundi (1,000 tonnes² at 30 % moisture content) (from ESMAP 1992 after ONATOUR).

		1984		1989	
highland bogs	Gitanga	570		550	
	Gishubi	170		131	
	Kuruyanga	210		173	
	Kashiru	10		0	
	Nyacijajima (Ijenda)	15		15	
subtotal		975		869	
lowland bogs	Nyamuswaga	2,300		2,300	
	Akanyaru ^{*)}	20,000		19,998	
	Byongwe ^{**)}	14,400		14,400	
	Ndurumi ^{***)}	17,600		17,600	
	Nyavyamo				
subtotal		54,300		54,298	
Total		55,275		55,167	

^{*)} According to ESMAP (1982) the three side valleys of Akanyura (Buyongwe, Ndurumu, and Kirundo) contain about 30% of all peat in the Akanyaru River Basin)

^{**)} About 250,000 tonnes (1 %) can be extracted as highland peat.

^{***)} Densely populated area, highly cultivated, no current peat activities.

Markov et al. (1988) estimate the peat resources of Burundi on 500 Mtonnes, a figure also used by Gati (1992), i.e. a volume 10 x higher than the data presented in table 2.

² The original data were expressed in MT = metric tonnes. This could be confused with Mtonnes (Mega-tonnes = 1,000,000 MT).

Mire and peatland losses

In order to promote the use of indigenous peat in all sectors of the economy, a parastatal peat company ONATOURE (Office Nationale de la Tourbe) was founded in 1977 especially to provide peat for a World Bank nickel exploration project. Since this project never materialized, ONATOURE started looking for other users of peat. (ESMAP 1992).

Fuel peat production is practised since 1977 in Kashiro (on 6 ha), soon followed by Kuruyange (on 20 ha) and Gishubi (on 22 ha), whereas peat extraction started in Gitanga (on 2 ha) and Buyongwe in 1984 (Bord na Mona 1985, UNDP/World Bank 1985, Table 3). The Kashiro peatland was already exhausted in 1985 and reclaimed for agriculture (cf. Table 2 and Table 3). The Nyacijaima peatland has a too high ash content for fuel peat extraction (UNDP/World Bank 1985).

Peat sales increased over the years and stabilized in the 1980s to approximately 1000 Mtonnes per month, of which 80% is consumed by the army (ESMAP 1992, table 3).

Table 3: Annual peat extraction and consumption (tonnes) in Burundi (from ESMAP 1992 after ONATOURE)

year	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Kashiru	42	1,301	1,759	2,079	1,893	1,513	2,234	1,518	711				
Kuruyange			944	944	1,155	5,262	4,891	3,559	2,305	3,411	5,212	4,396	4,553
Gishubi				511	3,387	4,124	6,168	5,734	3,184	4,760	4,786	2,642	4,033
Gitanga								3,254	2,713	3,879	7,532	4,161	4,312
Buyongwe								1,348	1,540		890	1,314	
Production	42	1,301	2,703	3,534	6,435	10,899	13,293	14,065	10,261	13,590	17,530	12,089	14,212
Sales ^{*)}	42	1,301	2,703	3,534	5,570	6,072	7,852	7,634	8,237	12,203	12,000	12,000	12,500

^{*)} The fact that peat extraction is higher than peat consumption reflects the losses as dust during transport and handling (normally some 10%) and poor planning.

Most peat extraction takes place from the highland peatlands, of which approximately 74% of the area (170 ha) is under exploitation. The lowland peatlands provide less than 10% (1,300 MT in 1989) of the total extracted peat volume (ESMAP 1992).

10% of the Nyamuswaga peatland was under cultivation in 1982 “but this may soon increase due to the high population density in nearby areas“ (ESMAP 1982).

As in the vicinity of Akanyaru and Nyamuswaga population density exceeds 200 inhabitants/km², large areas of these peatlands are used for agriculture, a use that is expanding because of the high population growth Pajunen (1996b). The northern part of Akanyaru is still in natural condition (Pajunen 1996b) and covered with *Papyrus* vegetation (cf. Bord na Mona 1985).

Still to be checked:

Bonnefille, R., Riollet, G., G. Buchet. 1991. Nouvelle séquence pollinique d'une tourbière de la crête Zaïre-Nil (Burundi). Review of Palaeobotany and Palynology 67:315-330.

Jolly, D., R. Bonnefille, R. 1991. Histoire et dynamique d'un sondage holocène de la Kuruyange (Burundi, Afrique Centrale). Palaeoecology of Africa 22: 265-274, Balkema Rotterdam

- Jolly, D., Bonnefille, R., M., Roux.** 1994. Numerical interpretation of high resolution Holocene pollen record from Burundi. *Palaeogeography, Palaeoclimatology, Palaeoecology* 109, 357-370.
- Mire Kuruyange in BURUNDI HIGHLANDS EAST OF lake Tanganyika (3 35' S, 29 41' E, 2.4 x 0.2 km , 2000 m, 11.84 m of peat, 9300 14C years old.
- Last 1000 years are missing because upper layer of peat has been exploited (Jolly et al. 1994).
- Jolly, D. & Bonnefille, R.** (1991) Histoire et dynamique du marécage tropical de Ndumuru (Burundi): données polliniques. *Rev. Palaeobotany & Palynology* 75: 133-151.
- 2 43' E, 29 58' E, 1367 m, w of Lake Victoria), 13 m of peat, 12.9-13 m deep: 2780 BP periodically inundated vegetation dominated by *Cyperus papirys* and *Dryopteris gongyloides*
- Bonnefille, R. & Riollet, G.** (1988) The Kashiru pollen sequence (Burundi): Palaeoclimatic implications for the last 40,000 yr B.P. in *Tropical Africa. Quaternary Research* 30: 19-35
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- Roche, E. & Bikwemu, G.** (1989) Paleoenvironmental change on the Zaire-Nile ridge in Burundi; the last 20,000 years: An interpretation of palynological data from the Kashiru Core, Ijenda, Burundi. Mahaney, W.C. (ed): *Quaternary and environmental research on East African Mountains*: 231-242. Rotterdam