

Information Sheet on Ramsar Wetlands (RIS)

Categories approved by Recommendation 4.7, as amended by Resolution VIII.13 of the Conference of the Contracting Parties.

Note for compilers:

1. The RIS should be completed in accordance with the attached *Explanatory Notes and Guidelines for completing the Information Sheet on Ramsar Wetlands*. Compilers are strongly advised to read this guidance before filling in the RIS.
2. Once completed, the RIS (and accompanying map(s)) should be submitted to the Ramsar Bureau. Compilers are strongly urged to provide an electronic (MS Word) copy of the RIS and, where possible, digital copies of maps.

LAKE NAKUWA WETLAND SYSTEM RAMSAR INFORMATION SHEET (RIS)

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2. Date: 16 September 2005.

3. Country: The Republic of Uganda

4. Name of the Ramsar site: Lake Nakuwa Wetland System

5. Map of the Ramsar Site:

Hard copy: attached
Digital (electronic) format: yes

6. Geographical coordinates: 33°18" – 33°43" E and 01°02" – 01°27" N.

7. General Location:

The Wetland is located 25 km from Pallisa town. It is situated in north central Uganda, in the districts of Kamuli (Kagulu, Nawaikoke, Bumanya, Gadumire and Namwiwa subcounties), Pallisa (Gogonyo, Apopong, Kasodo, Busetta and Pallisa subcounties) and Soroti (Pingire and Kateta sub-counties). Lake Nakuwa wetland system

includes lakes Nawampasa, Budipa and Nkodokodo, Murlu, and the northern swamps of lakes Nakuwa and Kyebiseke.

8. Elevation: 1,030 m above sea level.

9. Area: 91,150 hectares.

10. Overview:

Lake Nakuwa wetland system is a permanent wetland, which covers the eastern swamps of Lake Kyoga. The system is associated to a number of satellite lakes, which include Lakes Nawampasa, Budipa and Nkodokodo, Murlu, and the northern swamps of Lakes Nakuwa and Kyebiseke. The swamps are predominantly dense papyrus, broken in parts by pools of water forming sudd (clumps of floating papyrus).

Lake Nakuwa wetland system and its associated satellite lakes is part of Uganda's Important Bird Areas. The system is habitat to some of East Africa's rare and threatened birds.

The site acts as a fish nursery bed that generated 'prototypes' which later moved into the larger systems. It is therefore a critical refuge for diverse ecological types and genetic lineages (Mwanja and Amina, 2000). Lake Nakuwa Wetland System is important in that it contains characteristic and endemic fish species assemblages equivalent in morphology to a number of both the extant and extinct species, which include both known and several undescribed species that seem to be sister species to some that are known to be extinct from the main lakes (Mwanja and Amina, 2000).

Lake Nakuwa wetland System is a source of livelihood for the people living in the area. The system supports a strong fishery and provides hydrological values to the ecosystem and people living in the nearby areas. It controls floods and stores water for ground water recharge.

The site is proposed for listing mainly because of its strong fishery, its importance as refugia for endemic fish assemblages, which include both known, and several undescribed species, being a habitat to some of East Africa's rare and threatened birds, and its socio-economic importance.

11. Ramsar Criteria:

Criteria used to justify wetland include: 1, 2, 3, 4, 7 and 8.

12. Justification for the application of each Criterion listed in 11. above:

Criteria 1: Lake Nakuwa wetland system forms an unusual extensive and pristine wetland in Uganda.

Lake Nakuwa wetland system located at the heart of the Lake Kyoga wetland system is probably one of the remaining pristine wetland areas in Uganda due to its remoteness and sparse population in the immediate catchment. The wetland forms a mixture of satellite lakes and extensive marshes of papyrus broken into floating sudd

reminiscent of those in southern Sudan. This is the only wetland where suddes are found which move back and forth by the force of the Mporogoma River and back-surge of River Nile.

Criterion 2: Lake Nakuwa and Associated Satellite lakes wetland system supports endangered and rare endemic species of fish, reptiles and birds.

Here are two globally vulnerable bird species (Annex 3) namely: Papyrus Yellow Warbler (*Chloropeta gracilirostris*) and the Shoebill (*Balaeniceps rex*) regularly recorded in the swamps but highly persecuted by the local people for food, for sale and for superstitious reasons. Other East African Regional Red List threatened bird species (Bennun and Njoroge, 1996) in the system include the Marsh Widowbird (*Euplectes hartlaubi*) (Vulnerable) (Byaruhanga, et al., 2001).

The system also supports the Sitatunga (*Tragelaphus spekii*) (CITES App. III) and the Nile Crocodile (*Crocodylus niloticus*) (CITES App. II).

Criterion 3: Supports populations of plant and animal species important for maintaining the biological diversity of the region.

Lake Kyoga region is important for the big number of macrophytes, which form an important ecological component of the lake ecosystem and among which are outstanding plant species, which are endemic or threatened. Lake Nakuwa and associated satellite lakes also have been observed to have a rich submerged macrophyte ecosystem, which gives it higher fish species diversity than those without submerged macrophytes. Species diversity of *haplochromines* has been found to be higher in the satellite lakes and the diversity of non-haplochromine species has been found to be highest in Lake Nakuwa. It has been established that the high diversity of haplochromines in the satellite lakes was due to the submerged macrophytes (Annex 1 & 2). This is attributed to the protection accorded by the aquatic vegetation around the lakes. The satellite lakes are not suitable for the survival of the Nile perch, which has been prevented from spreading there due to the extensive swamps that separated the lakes from Lake Kyoga. The extensive vegetation cover also provides low oxygen conditions under which Nile Perch may not survive. These barriers have not allowed the Nile Perch to colonise and survive in the satellite lakes and cause damage to the fish species diversity. The current state in Kyoga satellite lakes is therefore closer to that of Lakes Victoria and Kyoga before the Nile Perch upsurge. The satellite lakes therefore are important in conservation of some of the trophic groups depleted from Lake Victoria. This observation indicates that haplochromines from the minor lakes play an important role in energy flow and overall ecological efficiency of these lake systems.

Lake Nakuwa wetland system and its associated satellite lakes thus contain the most diverse cichlid species assemblage and are a haven for a number of non-cichlid species currently not found in the large lakes of Kyoga and Victoria (Mwanja and Amina, 2000). The scale eating *haplochromines* of the genus *Allochromis*, thought to be endemic to Lake Victoria and extinct, still occurs in the satellite lakes associated with Lake Nakuwa. The system also holds other fish taxa that have been reported extinct in the main lakes. The taxa include genera: *Harpogochromis*, *Astatotilapia latifasciata*, *Prognathochromis*, *Lipochromis*, *Piscichromis*, *Psammochromis* and *Tridontochromis*. Other fish species contained in the system and considered of

conservation concern on account of endemism include 3 cyprinids *Barbus obesus*, *Barbus kiogae*, *Barbus longirostris* and a Cichlid, *Harpagochromis guiarti*.

The system is also important in the conservation of the bird species diversity especially of the globally threatened species in the region. The Fox's Weaver *Ploceus spekeoides*, Uganda's only endemic bird, is found at the site.

Criterion 4: Supports plant and / or animal species at a critical stage in their life cycles.

Lake Nakuwa wetland system presents the only opportunity for the survival of the threatened fish species as highlighted in criterion 3 above. The extensive swamp interspersed with the sudds cannot allow the Nile Perch to be established in the satellite lakes. The minor lakes therefore provide a great opportunity for conservation of fish species diversity threatened by introduction of exotics and other anthropogenic impacts in the Victoria and Kyoga lakes basins. Because of the system's importance for *haplochromines*, lead fish research agencies recommended the satellite lakes in the system be designated as conservation areas for *haplochromines* and other species threatened by introduction of exotics in lakes Victoria and main Lake Kyoga (Mbabazi, *et al* 2000).

The wetland supports a number of globally threatened species of birds including the Shoebill (*Balaeniceps rex*), Fox's Weaver (*Ploceus spekeoides*), Papyrus Gonolek (*Laniarius mufumbiri*), Papyrus Yellow Warbler (*Chloropeta gracilirostris*), all known or expected to breed at the site; the pristine nature of the wetland makes this area very important for the conservation of these species. The Lake Nakuwa and associated satellite lakes provide habitats for roosting, breeding, feeding and stopover sites for migration of birds (Byaruhanga, *et al.*, 2001).

Criterion 7: Supports indigenous Cichlid fishes including cyprinids and *Haplochromines*.

Lake Nakuwa and associated satellite lakes wetland system supports a number of indigenous fish. It supports several species of *haplochromis* species, which are believed to have gone extinct in Lake Victoria and Lake Kyoga. In addition, the system supports different trophic groups of the *haplochromis* fish, which is closer to that of Lakes Victoria and Kyoga before the Nile Perch upsurge. After the introduction of the Nile Perch, the *haplochromines* declined and currently only a few trophic groups consisting of insectivores, prawn eaters, zooplanktivores and molluscivores are commonly recorded in Lake Victoria. Before the Nile Perch upsurge, there were eleven trophic groups of *haplochromines* in Lake Victoria (Mbabazi *et al*, 2000). In Lake Kyoga, where Nile Perch has been established the longest, only two trophic groups of *haplochromines* are frequently encountered - the insectivores and molluscivores (Annex 4 & 5).

The satellite lakes therefore are important in conserving some of the trophic groups depleted from Lake Victoria. The trophic groups consist of indigenous fish species. It has been established that the satellite lakes play an important role in energy flow and overall ecological efficiency of these lake systems.

Several of the *haplochromine* species are endemic and several remain undescribed (Mwanja and Amina, 2000). The lake system has many lagoons that are separated from the main lake by swamps and it is hoped that these lagoons have probably experienced less change with respect to its fish fauna than Lake Victoria.

Criterion 8: Important source of food for fishes, spawning ground, nursery and / or migration path on which fish stocks, either within the wetland or elsewhere, depend.

The wetland systems have protected prey species by limiting exploitation by the Nile Perch. The extensive areas of fringing wetland, dominated by papyrus *Cyperus papyrus* and *Miscanthidium violaceum*, permit remnant populations of some species to persist in the small lagoons, satellite lakes, and tributaries separated by swampy divides from open water areas with Nile perch. Thick macrophyte growth inhibits the hunting efficiency and dispersal of Nile Perch. In addition, the extremely low levels of dissolved oxygen that characterize the dense interior of papyrus and *Miscanthidium* swamps also limit exploitation by Nile Perch since this species has a low tolerance to hypoxia. The swamps therefore form spawning grounds for several fish species, including *haplochromines*, which after breeding may migrate to the open waters.

13. Biogeography:

Lake Nakuwa Wetlands System falls in the Acholi-Kyoga region climatic zone (State of environment report 2002) and in the Lakes Kivu, Edwards, George and Victoria (and satellite lakes) Freshwater Ecoregion (from WWF's "Freshwater Ecoregions of Africa" classification)

Lake Nakuwa wetland system is predominantly situated in the Lake Victoria Regional Mosaic biogeographic region to the south and the Sudanian regional centre of endemism to the north. The main vegetation type is predominantly wooded savanna.

14. Physical features of the site:

Climate

Lake Nakuwa region exhibits a tropical climate, which is influenced by the Inter-Tropical Convergence Zone (ITCZ) and the air currents such as the southeast and northeast monsoons. It normally experiences two wet seasons and two dry seasons. Lake Nakuwa wetland system receives a bi-modal medium rainfall (State of Environment Report, 2002) ranging between 1000 – 1500 mm (State of Environment Report, 1998). The first rain season normally runs from March to May and the second rains run from September to November of each year. It is normally during the rainy seasons that the Lake Kyoga region in which Lake Nakuwa falls experience floods. The floating sudds tend to block the water runways connecting the lakes thereby causing floods in the catchment areas. The dry seasons run from December to February and June to August of each year. Average rainfall is 1,400 mm, with a growing season of 240 – 270 days.

Average temperature is 28°C. Because of the relatively high temperatures, evapotranspiration at Nakuwa wetland system ranges between 1600 – 1750 mm for most part of the system (State of Environment Report, 1998). However, for the northeastern parts of Lake Nakuwa, evapotranspiration ranges between 1,750 – 1,900 mm. Evaporation total per year ranges from 1,516 mm to 1,623 mm, with the lowest month being July - 91 mm and highest month being – April 161 mm.

Soil: Lake Nakuwa and associated wetland system is underlain by Pre-Cambrian, Cenozoic rocks predominated by Pleistocene to recent rock series. It is also comprised of the wholly granitised rocks of granitoid and the highly granitised rocks in some areas.

The rocks have given rise to predominantly ferrallitic soils, mainly sandy loams of a dominant red colour, with a patch of hydromorphic soils to the northern tip of the Lake Nakuwa swamp. The soils are porous with a stable structure. The soils support a wide range of crops and its productivity is ranked moderate to high; it is rated as the most fertile and productive soil in Uganda (State of Environment Report, 1998).

Hydrology: Lake Nakuwa is fed mainly by Lumubuye swamp / river from the south. Others including rivers Naigombwa, Mpologoma, and Namatala also flow into Lake Nakuwa through extensive papyrus swamps from the south-eastern side of the wetland system. The lake drains through extensive papyrus swamps into lakes Nawampasa, Namasejeri and finally to Lake Kyoga.

No information is available on water quality, Soil chemistry, Soil pH, Sediment characteristics and water depth fluctuations.

15. Physical features of the catchments area:

The wetland system is made up of the Tanganyika surface (which dominates) and Lake Sediments on Tanganyika surface geomorphic units (Aniku, 1996). The geomorphic units make up many of the peculiarities of landscape and soil patterns in the catchment. The landscape is generally flat and creates a floodplain which is part of the Lake Kyoga Basin. The features of the catchment are relatively similar to those of the site (refer to section 14).

16. Hydrological values:

The system plays an important hydrological role for the waters entering the ecosystem and people living in the nearby areas. It controls floods from the runoff entering the system. The extensive floodplain fringing Lake Nakuwa Wetland system has for long also acted as a natural filter for the silt, sediments and excess nutrients in the incoming surface runoff and wastewaters into the Kyoga Basin lakes and rivers. This helps to purify the surface run-off and maintain the natural clean water conditions important for the survival of many fish species. During the dry season, the system maintains a steady discharge of water and supplements the water supply to the surrounding areas. It also stores water for groundwater recharge.

17. Wetland Type in order of importance:

Tp (permanent freshwater marshes); **O** (permanent freshwater); **Ts** (seasonal freshwater wetland).

18. General ecological features:

The Swamps are predominantly dense papyrus, broken in parts by pools of water forming suddes (clumps of floating papyrus). Sometimes these suddes open up completely forming small lakes. Some lakes like Nawampasa are very shallow and covered by *Nymphaea* species with short sedges, dominated by *Cyperus latifolius* occupying the drier parts of fringing papyrus swamp. These shallow areas are important for both waterbirds and surrounding fishing communities. Lake Nawampasa is a small lake surrounded by swamp vegetation of mainly *Miscanthidium*. Papyrus abounds towards the inner edges of the water while a rare aquatic grass *Urythrum digitatus* is free floating together with the water lilies forming an extensive wetland of the recently flooded area.

19. Noteworthy flora:

The wetland system is important for its macrophyte plants. Noteworthy plants include *Urythrum digitatus* a free-floating rare aquatic grass and *Suddia sagitifolia* an endemic plant in the Lake Kyoga region. Until two years ago, this plant was only known to occur in Southern Sudan. It is now established that the origin of the plant is in Kyoga basin Lakes and rivers.

20. Noteworthy fauna:

Noteworthy fauna for Lake Nakuwa wetland system include two globally vulnerable bird species, the Shoebill *Balaeniceps rex* and the Papyrus Gonolek *Laniarius mufumbiri*. East African Regionally threatened species of conservation interest include the White-winged Warbler (*Bradypterus carpalis*), Papyrus Canary (*Serinus koliensis*), Northern Brown-throated Weaver (*Ploceus castanops*), Grey Heron (*Ardea cinerea*), Goliath Heron (*Ardea goliath*), Purple Heron (*Ardea purpurea*), Papyrus Yellow Warbler (*Chloropeta gracilirostris*), African Marsh Harrier (*Circus ranivorus*), Grey Crowned Crane (*Balearica regulorum*), Lesser Jacana (*Microparra capensis*), Marsh Widowbird (*Euplectes hartlaubi*) and the Red-chested Sunbird (*Cinnyris erythrocerca*)

The diverse cichlid fish species assemblage: the scale eating *haplochromines* of the genus *Allochromis*, endemic to Lake Victoria and thought to be extinct. Before the Nile Perch upsurge, there were eleven trophic groups of *haplochromines* in Lake Victoria (Mbabazi et al, 2000). These included insectivores, piscivores, higher plant eaters, zooplantivores, crab eaters, prawn eaters, peadophages, algae eaters, molluscivores, parasite eaters and detritivores. After the Nile Perch upsurge and the decline in *haplochromines* only four trophic groups consisting of insectivores, prawn

eaters, zooplanktivores and molluscivores are commonly recorded in Lake Victoria. In Lake Kyoga, where Nile Perch has been established the longest only two trophic groups of haplochromines are frequently encountered - the insectivores and molluscivores. The Mukene (*Rastrineobola argentea*) has become Lake Kyoga's important commercial fish species.

Other fauna worth noting include the Sitatunga *Tragelaphus spekii* and the Nile crocodile *Crocodylus niloticus*.

21. Social and cultural values:

The local community use the system as a source of water for both domestic use and livestock, and as a source of food (rhizomes) during prolonged droughts. Local community members also harvest raw materials from the system used for making crafts e.g. Papyrus. Illegal hunting of wildlife especially the endangered Sitatunga is prominent in the area.

The system supplies fish protein for home and commercial consumption to the nearby local population and offers considerable employment opportunities to a number of fishermen. The Mukene has become an important fishery on Lake Kyoga in addition to other commercial fisheries species.

The surrounding dry land area is used for agriculture and human settlement.

22. Land tenure/ownership:

a) Within the Ramsar Site:

According to the 1995 Constitution, wetlands are held in trust for the people by the government of Uganda. The government therefore owns Lake Nakuwa wetland system on behalf of the people.

b) In the surrounding area:

Land in the surrounding areas is under customary ownership

23. Current land (including water) use:

Land uses within the Ramsar Site

Lake Nakuwa wetland system is mainly used for fishing for home consumption and for commercial purposes. Because of the commercial fishery a lot of human settlements have sprung up and the number of livestock has grown as a result. With the growth of the population, illegal hunting of the Sitatunga for meat has also increased. The system is also used as a source of water for both livestock and domestic use, and as an important grazing area for the local community during the dry season.

The associated satellite lakes are a potential area for use in research because of their importance as habitat for *haplochromine* species, which are thought to be extinct in the main lakes.

Land uses within the surrounding / catchment areas

In the catchments around the wetland system, subsistence farming and livestock grazing is practiced. Crops grown include: maize, millet and plantain. People harvest papyrus vegetation for making mats, thatching, and for other uses.

24. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land (including water) use and development projects:

Threats arising from within Ramsar Site

The potential threats to fish species diversity in Lake Nakuwa and associated satellite lakes include human exploitation, collection of ornamental fish for export, degradation of the fish habitat, spread of the Nile Perch and water hyacinth. The other threat to these lakes is due to harvesting of papyrus and the reclamation of land for agriculture. This not only destroys potential refugia but also exposes these shallow lakes to siltation.

The spread of the Nile Perch can be dangerous to these lakes especially if the habitats of these lakes become suitable for its survival. The Nile Perch has been prevented from spreading to many of the satellite lakes due to the extensive swamps that separated the lakes from Lake Kyoga. The extensive vegetation cover also provided low oxygen conditions under which Nile Perch may not survive. Destruction of these barriers may allow Nile Perch to colonize and survive in these lakes and cause damage to the fish species diversity. Findings from a study conducted on the trophic structure of Lake Kyoga *haplochromines* have indicated that the introduction of the Nile perch in the Lake Kyoga area have simplified the trophic structure of *haplochromines* from seven trophic groups to two (Mbabazi et al, 2000). Only two groups are frequently encountered, the insectivores and molluscivores.

Ornamental fish collectors pose potential threats to the satellite lake *Haplochromine* species. Use of destructive fishing gear, gear sizes and fishing methods is also another cause for the decline in the fisheries industry.

Threats arising from the surroundings and catchment area

Grazing and cultivation is a threat to water plants in the area. Wetland reclamation for agriculture and annual bush burning leads to loss of habitats for the birds. Macrophytes have been destroyed as a result of harvesting of papyrus and reclamation for agriculture. Most stands of vegetation and other marsh plants on the shores are likely to disappear due to cattle grazing yet most of these serve as breeding grounds for birds. The numerous fishermen on these lakes pose a lot of threats to birds because of their gill nets and physically disturbing the birds. Annual wildfires from uncontrolled settlements by fishermen lead to destruction of habitats. The main area

affected includes the seasonal wetlands in the eastern part of the Lake Nakuwa wetlands system, which is targeted for mud fishing especially in the dry season.

The use of firearms to hunt the Shoebill needs to be discouraged through a public awareness campaign, which in addition to stressing the global significance of the species, should address some of the negative cultural beliefs, such as the bird being a bad omen for fishermen.

25. Conservation measures taken:

The area is an Important Bird Area (IBA) (Byaruhanga, et al., 2001). The System has no management plan. But the District officials for Kamuli district expressed interest to the Wetland Inspection Division for implementation of activities to promote the conservation of the wetlands in the district. The lead agency for fisheries research (Fisheries Research Institute FIRRI) recommended the site for conservation due to fish diversity and endemism.

Ornamental fish dealers are being encouraged to start captive breeding of the ornamental fish species for export to reduce pressure on the satellite lakes fishery. A demonstration centre for breeding the ornamental fish species was set up at FIRRI in Jinja.

26. Conservation measures proposed but not yet implemented:

Based on the survey results of the Lake Kyoga region satellite lakes by Fisheries Resources Research Institute, it was recommended that some of the lakes be designated as conservation areas for fish species threatened in the main lakes especially the *haplochromine* species and other species threatened by introduction of exotics in lakes Victoria and main Lake Kyoga. It is not yet clear what measures have been taken since the study.

Wetland Inspection Division is planning to develop a management plan with Kamuli District local government. Also, the Fisheries Resources Research Institute (FIRRI) has been implementing Lake Kyoga Basin Intergrated Lake Management Project. The project works for the conservation of the lakes in the Kyoga basin through the involvement of the local community. The local community form beach committees which manage fishing and the landing sites including developing bylaws.

27. Current scientific research and facilities:

Fisheries Resources Research Institute (FIRRI) has been conducting a series of studies about the fisheries of the Lake Kyoga region satellite lakes. The studies are aimed at finding the role of Kyoga region satellite lakes in the conservation of fish species diversity. The study revealed that many fish species and *Haplochromine* trophic groups, which existed in lakes Victoria and Kyoga prior to the Nile Perch introductions, are present in the Kyoga region satellite lakes.

Nature Uganda has also been conducting regular bird counts in the area.

28. Current conservation education activities related to communications, education and public awareness (CEPA) related to or benefiting the site:

*Nature*Uganda has been conducting education and awareness/ sensitisation about the importance of the area for bird species conservation in Uganda. Fisheries Resources Research Institute (FIRRI) is sensitising ornamental fish dealers about starting captive breeding so as to avoid impacting negatively on the *Haplochromine* species and their populations. Towards this goal, FIRRI set up a breeding demonstration in Jinja. Wetlands Inspection Division is undertaking sensitisation of the local community about the importance of wetlands in the area and the wetlands policy.

29. Current recreation and tourism:

Currently, there is no significant activity by way of tourism and recreation. However, the area is a potential site especially for bird watching. *Nature*Uganda has been promoting the Kyoga area as an important bird area with a potential for bird watching.

30. Jurisdiction:

- a) Territorial – Kamuli, Pallisa and Soroti District Local Governments and their lower councils
- b) Functional – National Environment Management Authority, Wetlands Inspection Division, District Environment and Fisheries Officers for Kamuli, Pallisa and Soroti Districts.

31. Management authority:

According to the 1995 Constitution, wetlands are held in trust for the people by the government of Uganda. Functionally therefore, Lake Nakuwa and associated satellite lakes wetland system is in the hands of the Central Government. The 1997 Local Government Act devolved the wetland management to the District Local Governments.

Therefore, the management authorities are:

1. Kamuli District Local Government
(Kagulu, Nawaikoke, Bumanya, Gadumire and Namwiwa Sub-counties)
P. O Box 88,
Kamuli
UGANDA
2. Pallisa District Local Government
(Gogonyo, Apopong, Kasodo, Buseta and Pallisa Sub-counties)
P. O Box 14,
Pallisa
UGANDA

3. Soroti District Local Government
(Pingire and Kateta Sub-counties)
P. O Box 61,
Soroti
UGANDA

32. Bibliographical References:

Reprints or copies of the most important literature including the following:

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