

COOPERATIVE USE OF RESEARCH AND TRAINING VESSELS IN THE EAST AFRICAN REGION (LAKE VICTORIA)

UGANDA REPORT

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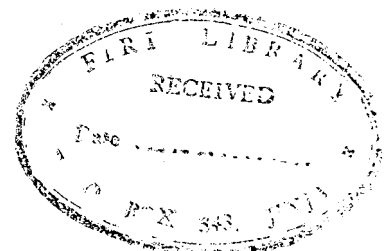


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Acronyms

ADCs	Agricultural Development Centres
ADP	Agricultural Development Project
ARDC	Agricultural Research and Development Centres
CAO	Chief Administrative Officer
CBOs	Community Based Organisations
DFO	District Fisheries Officer
DRC	Democratic Republic of Congo
DWD	Directorate of Water Development
EAC	East African Community
EAC	East African Cooperation
EAFRO	East African Freshwater Fisheries Research Organisation
EPRC	Economic Policy Research Centre
FIRRI	Fisheries Resources Research Institute'
FOSRI	Food Science and Technology Research Institute
FRO	Fisheries Resources Department
FTI	Fisheries Training Institute
HP	Horse Power
LVEMP	Lake Victoria Environmental Management Project
LVFO	Lake Victoria Fisheries Organisation
LVFRP	Lake Victoria Fisheries Research Project
MAAIF	Ministry of Agriculture Animal Industry and Fisheries
MSc	Master of Science
MT	Metric Tonnes
MUK	Makerere University Kampala
NAAS	National Agricultural Advisory Services
NARO	National Agricultural Research Organisation
NEMA	National Environmental Management Authority
NGOs	Non Governmental Organisations
TIC	Technology Testing Centres
UFFCA	Uganda Fish and Fisheries Conservation Association

Executive Summary

There are two functioning research and training vessels in Uganda owned by Fisheries Resources Research Institute at Jinja. R.V. IBIS (180HP) and R.V. MPUTA (125HP) though both functioning, they are constantly breaking down and lack some essential navigation and safety equipments. The two vessels are currently in use 10 days per month each and have occasionally been borrowed by Lake Victoria Environmental Management Project (LVEMP) and other foreign institutions for offshore limnological sampling. R.V. IBIS is maintained by Lake Victoria Regional Fisheries Research Project (LVFRP) and R.V. MPUTA is to be maintained by LVEMP. Several outlined planned research and training activities needing the services of the vessels, have been identified along with the estimated running and maintenance costs for the period the vessel, would be in use. The institutions, with planned activities needing the services, of these vessels, were glad that the idea was timely and reduces on the costs, encourages sharing of scientific knowledge and collaboration. The planned activities were identified mainly in national training and management institutions and regional offshore, limnological sampling.

Two proposals justifying the importance of cooperative use of research and training vessels, and joint research programmes on Lake Victoria are included in the report. There were no major constraints identified in the institutions/departments that would curtail the proposals of sharing vessels for research and training or joint research on Lake Victoria.

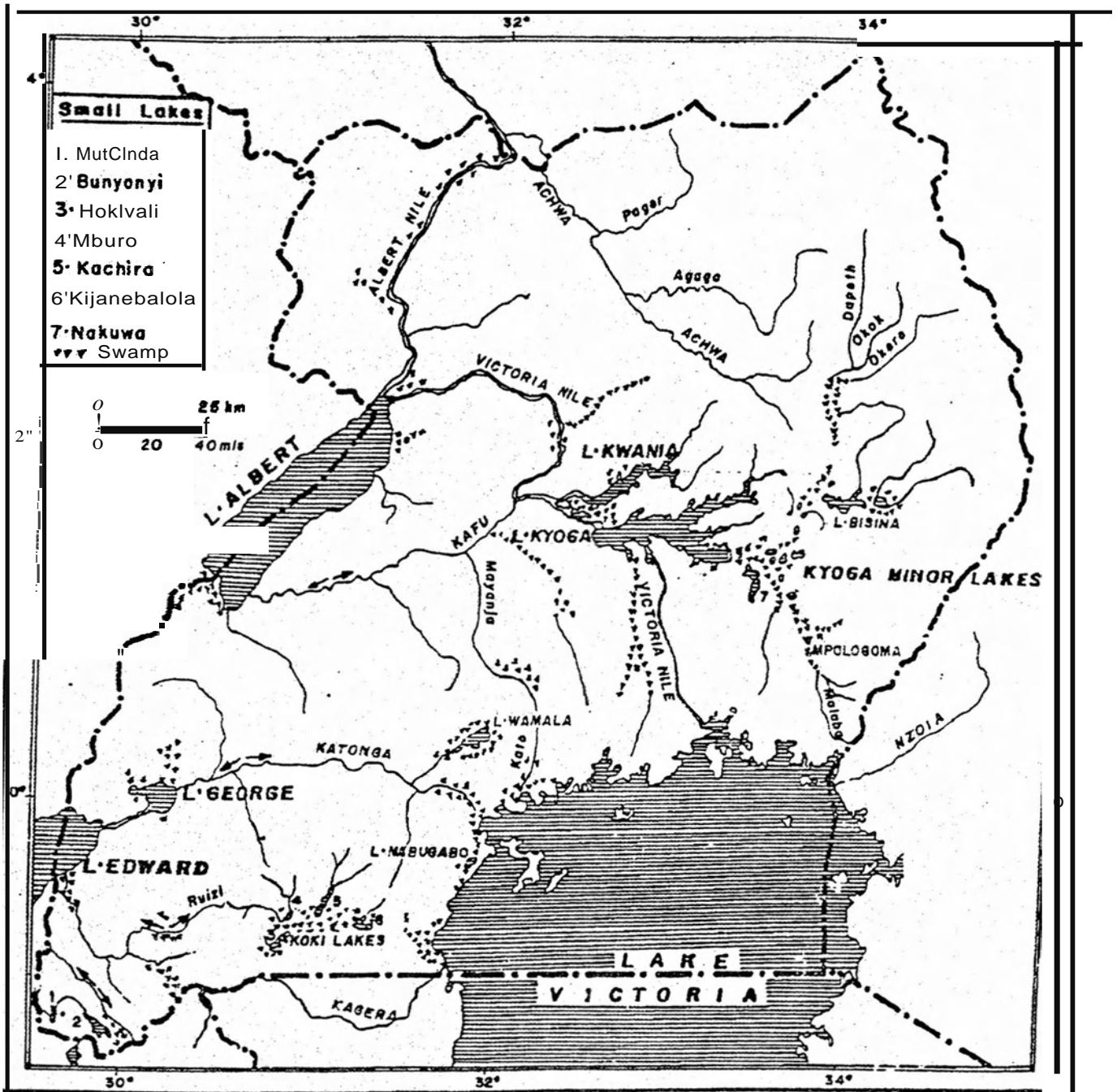


Fig. 1. Map of Uganda showing the capture fisheries production systems (Lakes and Rivers).

Background

Lake Victoria (68,800km²) the second largest lake in the world is an international water body of great economic importance to the three riparian countries of Kenya, Tanzania and Uganda. The lake is of great scientific and cultural significance to the global community mainly in respect to its water uses, unique biodiversity both flora and fauna. The lake is used as a source of food, drinking, and irrigation water, shelter of flora and fauna, transport and repository for human, agricultural, municipal and industrial waste. The lake basin provides livelihood for about 30 million people which is about a third of the combined population of the three countries' (EPRC, 1999). With the population of the three riparian communities growing at about 6% per annum (World Bank, 1996), the multiple activities in the basin have increasingly come into conflict and the ecosystem is under ~~growing~~ ^{young} substantial changes.

These changes are caused by human activities through agriculture, urban runoff, discharge of domestic and industrial waste, conversion of wetlands into other uses, open access policy and uncontrolled fishing activities. The lake fauna and flora, species composition and biodiversity and quality of water have changed. Massive blooms of algae have developed, water borne diseases have increased, water hyacinth is a nuisance, there is increased fishing effort and fishing intensity, the oxygen depletion (Hecky, *et al*" 1988) is threatening the artisanal fishery and biodiversity.

The policy of the riparian states is that the aquatic biological resources must be used sustainably and environmental quality maintained to achieve conservation of biodiversity for future increasing population. It is important therefore, to make any planned developments sustainable through technological solutions in fisheries, water environment and quality, geophysical and biochemical characteristics and socio-economic issues. Some of these studies are ongoing and others are being planned. There is therefore need to integrate all these efforts at both national and regional levels through cooperative research and use of the available facilities on Lake Victoria. However, institutional financial deficiencies pose constraints to solving the problems.

Policy in fisheries research - situation in Uganda.

The fisheries research policy in Uganda goes along the national policy outlined in EPRC, 1999 document. The policies aim at research into generating information/technologies, recommendations, packaging and disseminating them to the stakeholders (policy makers, public, communities) for policy formulation, management and sustainable exploitation of the aquatic resource while conserving the biodiversity and aquatic environment.

The fisheries research policy is therefore to carry out research that promotes:

- Efficient sustainable utilisation of aquatic resources for increased fish production to improve the nutritional standards of the people at the same time contributing to the growth of the national economy.
- Employment opportunities through fishing, fish processing, fish distribution and marketing, fish farming, fishing gear technologies and other fishery related activities.
- Foreign exchange through export of fish and fish products.
- Improved traditional fish processing methods
- Protection of the aquatic environment and multiple uses of lakes and rivers.
- Strengthen national, regional and international collaboration and cooperation to sustain the shared resource and environment.
- Propagated aquaculture in order to supplement fish production from lakes, rivers, swamps, reservors and increase incomes of the fisherfolk

The fisheries research policy is demand driven, client oriented, cost effective research in fisheries and related aspects of water environment. The research in Uganda has to satisfy the major national policy of:

- Poverty eradication
- Food security
- Employment
- Export

There are also NARO' guidelines for collaboration in agricultural research, development and dissemination to fulfill the National development objectives of improving agricultural production for supply of adequate food and raw materials and improving the quality of life.

The guidelines of NARO include

- *All national, regional and international research organizations can do mandated research in collaboration with NARO*
- *With or without existing Memorandum of Understanding all research organizations wishing to collaborate with NARO will sign a specific Contractual Agreement with NARO before the execution of the project and provide terms of reference for both NARO and collaborators.*
- *There will be monitoring during project execution.*
- *All research data (raw or processed) will be jointly owned and used. Collaborating institutions must acknowledge NARO and/ or its staff when such data is published - permission may be needed from national authorities for restricted materials, movement/transfer out of the country.*
- *Reports from collaborative institutions.*
- *Any capacity building activities involving NARO staff in the project shall be done in accordance with NARO's priorities*
- *The resources contributed by collaborating institutions shall be well defined, monitored, evaluated and accounted for including funds, materials and equipment.*

- *All equipments and materials procured must conform to verifiable standards or agreed upon between NARO and the collaborators and should be available to all project personnel during the project period. At project end, ownership of the assets shall be as defined in contractual agreement.*
- *All NARO facilities may be used in collaborative research between NARD and the Organisations on terms that will be specified in Contractual Agreement.*
- *All project executed by organizations in collaboration with NARD may include a project administration charge that shall be mutually agreed.*
- *Any disputes between the parties arising out of the interpretation or execution of the Contractual Agreement shall be settled by mutual agreement or arbitration in accordance with relevant Arbitration Laws/Regulations.*

Research and Training Institutions in Uganda

Research and training in fisheries, aquatic systems and other fishery related aspects are carried out by FIRRI, MUK department of Zoology at degree and MSc level, LVEMP, LVFRP while training of students and clients (mainly the fisherfolk and fish farmers, public and communities in general) is conducted by the above institutions in addition to LVFO, FTI, NEMA, FOSRI, CBGs, NGOs and the district based fisheries extension staff who are mainly graduates, some operating at sub county level.

Research Profiles

The research profile in Uganda includes:

- Research that generates information/technologies, packages, disseminates them to stakeholders for improvement of aquatic resources management, conservation and aquatic environmental health maintenance.
- Research that generates technologies, on improved fish farming and fish post harvest issues, packages and disseminates them
- Research into areas of fisheries policy to ensure that the objectives of the policy and strategies are fulfilled
- Research into any new area that impact fisheries and aquatic environment

Environmental Research

Limnology/water environment

The research seeks to **understand** the environmental basis and constraints to fishery production by generating information on the state and dynamics of the water environment and on its facilitation of and influence on productivity mechanisms in aquatic systems. The *information* gathered is for giving advice on:

- Protection of **water** quality for human and animal life;
- Physico-chemical **and** biological processes that determine productivity of the water resources especially the fisheries;
- Interaction or interference of man's activities with natural production processes leading to fish production;
- Use and importance of wetlands including water hyacinth infestation.

Fisheries Research . .

The research aims at generating information/technologies and policy recommendations that enhance the proper management of the fisheries to make them sustainable for the **benefit** of the current and future generation.

The information packaged and disseminated is provided on:

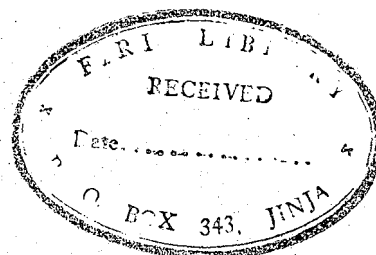
- Population ecology and biology of the fishes
- Changes in fish stocks, quantity and fish species diversity.
- Gear technologies
- Socio-economic aspects of the fishing industry and advises on fishery management, policy and legislation.

Aquaculture

The research aims at supplementing increased fish production in lakes, rivers and **dams** by growing fish in ponds and replenishment of important fish species that disappear in lakes or rivers. It determines, selects and breeds suitable fish species, develops suitable feeds and management **packages** that address farmers' constraints. . .

Post harvest. Fisheries

The research aims at ensuring safety, quality and wholesomeness of fish and fishery products before placement in both domestic and foreign markets for utilisation. The post harvest loss and fish quality assurance research starts with fish capture to when the fish is on the table for consumption. The technologies packaged therefore, are to enable quality assurance during harvesting, handling



processing, packaging and marketing of fish and fish products to local or foreign markets.

Socio-economic Research

The research aims at linking a number of studies in the fishery sector covering a wide range of issues that empower decision makers in the public, private and community circles to take appropriate decisions in the management, exploitation and utilisation of the aquatic resources optimally and on sustainable basis. The research finds solutions to constraints in fishery industry which the stakeholder find in their day to day activities. The research focuses on the following among other issues:

- Analysis of structure and functioning of fishing communities
- Social and economic issues
- Assessment of costs of production
- Enterprise profitability and competitiveness of operating units
- Assessment of technology alternatives and evaluation of economic losses
- Investigations into fish marketing systems
- Demand, supply and consumption studies
- Assessment of performance of the fishing industry
- Analysis of macro economic and policy issues
- Assessment of fisheries contribution to national economy
- Consequences of changes in fisheries policies

Training Programmes

In Uganda government's policy for modernization of agriculture (including fisheries sector) and poverty eradication, emphasis is placed on the importance of having a well informed public as part of the fisheries sector development (National Draft Fisheries Policy, 2000). Public education programs for the fisherfolk, fish farmers and the general public increases the awareness and understanding of fisheries concerns. These training programs are carried out by the fisheries extension delivery system which, it is proposed soon or later to operate under National Agricultural Advisory Service (NAAS). The fisheries extension system is now at the sub county level in Uganda's decentralised system and is manned by the fisheries sub county officers who are mainly bachelor of science majoring in Zoology. These officers though not conversant graduates in fisheries and related aspects have been trained/or being trained by FIRRI and Fisheries Resources Department (FRD). The training programs for the fisherfolk, fish farmers, communities and the public are conducted by current CBOs and NGOs who, in their information/technology dissemination provide a back-up support for the existing district-based extension systems. Of the NGOs for example, UFFCA with the assistance of LVFRP has started sensitization training programmes on the radios for fisherfolk and the public on fisheries and

related aspects. It is hoped to extend these training programmes to Kenya and Tanzania regions of Lake Victoria.

Other training programmes in fisheries and related aspects are carried out by institutions/departments like the National wetlands programme of the Ministry of Natural Resources, on the importance, use and protection of wetlands, (NEMA) National Environmental Management Authority, (DWD) Directorate of Water Development in the ministry of Natural Resources on the importance of clean water and protection of the water environment, FOSRI (Food Science and Technology Research Institute) on maintenance of high quality fish, food and other fish products for local and domestic markets in both industrial and artisanal production.

Currently, the Fisheries Training Institute (FTI) at Entebbe runs certificate and diploma courses in fisheries, aquaculture, gear technology, boat building etc for students who, after completing the courses go out to educate the public and communities. FIRRI participates in the training programmes of the Training Institute.

Lake Victoria Fisheries **Organisation** has training programmes and coordinate research and management of Lake Victoria fisheries resources and other fisheries related activities for sustainability and improvement of L. Victoria fishing industry.

NARO through FIRRI and in conjunction with MUK (Zoology Department) are currently conducting MSc courses in fisheries and it is hoped to initiate first degree courses soon. NARO-FIRRI conducts programmes for fisherfolk, students from tertiary institutions and the public through its outreach and technology dissemination channels. These include visits to school/colleges, fish farmers, fish landing sites and through other identified technology uptake pathways well laid out (NARO, 1998). Workshops, on-farm trials and technology verification centres are also used by NARO for training. Zonal Agricultural Research and Development Centres (ARDCs), Agricultural Development Centres (ADCs) and **Technology Testing Centres (TICs)** have been set up by NARO and some of them are operational for training purposes.

Other mechanisms for Training and Technology Dissemination

FIRRI has other training programmes which are frequently on the media (television, radio, newspapers) for fisherfolk, extension staff, NGOs, CAOS, students (primary, secondary, tertiary) and the communities. For training, posters, brochures, video tapes, monographs, publications and other demonstrations relevant to the specific training program are used. LVFRP, LVEMP which operate on L. Victoria in the riparian states have training programmes relevant to management and sustainable exploitation and utilization

of aquatic resources while conserving biodiversity. Among their tasks, is that of community participation in fisheries management - co-management.

Research Programmes

Ongoing and planned research programmes and budget for various institutes / organisations / departments are shown in Table 1 and the method for the estimated costs for the number of days the vessel is needed in a year is shown in Table 2. Some institutions have ongoing programmes while others have plans to start research or training programmes.

The Fishing Industry in Uganda

Aquatic systems including vast wetlands which are the most important sources of fish cover about 18-20% of the country's surface area comprising of five major lakes and about 160 small lakes and several rivers (Fig. 1). Lake Victoria (68,800km²) shared between Kenya (6%), Tanzania (51%) and Uganda (43%), Lake Albert (5,335km²) shared between Democratic Republic of Congo (46%), and Uganda (54%), L. Kyoga (2047km²), L. Edward (2,203 km²) shared between ORe (61%) and Uganda, (39%) and L. George (250km²). The current fisheries resource base is of capture fisheries (artisanal) and aquaculture (fish farming). There is a high biodiversity of fish and other aquatic organisms. Some beautiful fishes (ornamental) are found in these lakes; especially Kyoga basin lakes-complex and Lake Victoria. There are fish species which are of cultural importance while others are of medicinal value like the haplochromines. Other components of aquatic system especially algae, macrophytes and invertebrates are important in sustaining a stable productive ecosystem. It has been reported (Ogutu-Ohwayo, 2000) that the country is rich in aquatic biodiversity. Up to 55 algal species, 62 zooplankton species, 37 macroinvertebrate species etc sustain a stable productive system comprising of about 280 species of fish. The aquatic systems in Uganda are all almost virtually public property. This undefined ownership and free access has, not only affected resources but has reduced commitment to their management especially by the user communities.

There is excessive fishing effort on all the lakes. The fishing canoes on L. Victoria (Uganda) for example operating from an estimated 715 fish landing sites (Tumwebaze and Coenen, 1991) was estimated at 15,000 canoes composed of 1,700 dugouts, 3,450 parachute 63.3% Ssesse of which 12.9% are motorised (Muhoozi - frame survey Lake Victoria Uganda, 2000 personal communication).

It was reported that there were 17,000 fishing crafts on all Uganda water bodies with 20% of them motorised (Orach-Meza, 1996) but presently on Lake Victoria alone, there are about 16,000 crafts and about 25% are motorised. (Muhoozi personal communication). Total fish production from Ugandan lakes and rivers was estimated at 217,000 tonnes in 1998 of which 48.5% came from L. Victoria. This put per capita fish consumption at about 10-15kg. Aquatic fish production in

order of importance were Lake Victoria 50%, L. Kyoga 37%, L. Albert and Albert Nile 8%, and Lakes George and Edward 2.4%. The minor lakes produced less

Table 1a. Cooperative use of research and training vessels – Lake Victoria - ongoing and planned activities (programme) for research, education and training needs requiring services of specialized vessels

Institution / Department / Organization / Project	Description of research/education or training programme		Programme: Regional, National, Institutional		Person nel requirements		Research/training/education Duration of cruise Days / year		Estimation of cost USS for the number of days vessel needed in a year Consider fuel, wear&tear, crew (1)trainer, (2)trainees, (3) scientists, miscellaneous	
			Ongoing	Planned	Ongoing	Planned	Ongoing No. of days	planned No. of days	Ongoing	planned
-FIRRIILVFRP	Ongoing: Short-term = S1yr Medium term = M 2-3yrs Long-term = L>3yrs	Planned: Short-term = S1yr Medium term = M 2-3yrs Long-term = L>3yrs	Ongoing	Planned	Ongoing	Planned	Ongoing	planned	Ongoing	planned
	Stock Assessment .. L		Regional		5 scientists		120		55800:	
	Hydro acoustics -L		Regional		1 scientist		40		18600:	
	Water environment (go with stock assessment) L		Regional		2 scientists		120 go (with stock assessment)		RVIBfS	
					6 crew each					
FIRRI/IVEMP	Fish Biology & Biodiversity - L		Regional		8 scientists 6 crew IBIS offshore MPUTA inshore		40		25800	
FTI		Training in fishing technologies (trawling), navigation, seamanship and sampling techniques - L		Institutional		2 scientists 6 crew 15 students RV MPUA		30		RVMPUTA 14510 1,2,3 out
UFFCA		Training and education of fisherfolk in remote islands - L		National		15 UFFCA 6 crew RVIBIS		10		6450 1,2,3, out
MUK (Zoology)		Fisheries courses on L. Victoria - L		National Regional Institutional		60 students 6 crew 2 lecturers RVIBIS		20		12,900 1,2,3, out
	Nature society and water (Norway)	Training undergraduates in aquatic sciences	National	National						
FRD		Monitoring and surveillance Training fisherfolk L		National / Regional		11 FRO Officials 6 crew RVIBIS		120		77.400 1,2,3, out

Estimation of running costs of a vessel per day Fuel =horse power x 1509 fuel/HP/hour. Assume 9 hours of engine running per day.

	R.V. IBIS (HP 180)	R.V. MPUA (HP 125)
Fuel:	$\frac{180 \times 1509 \times 9}{1000}$	$\frac{125 \times 1509 \times 9}{1000}$
	=243L	= 169L
Add 15% emergency	37L	25L
Add 25% repairs, wear & tear	61L	42L
Total fuel	341	236L
Current fuel price-per litre 25/9/000 =1330/=		
Cost of fuel per day	Ug. Shs. 453,530	Ug. Shs 313,880
US\$=1800/= 25.9.00	US\$ 252	US\$174
6 crew	US\$ 160	US\$ 100
Running cost per day	US\$412	US\$ 274
Engine oil	US\$ 13	US\$ 11
Greese	US\$4	USS3
Hydraulic oil	US\$13	USS10
Oil and fuel-filters	US\$1.5	US\$1.5
Batteries	US\$2	USS 1
Acid	US\$ 2.8	US\$ 1.4
Distilled water	US\$ 2.8	US\$ 1.4
Ice	US\$ 2.8	USS 2.8
Generator fuel	US\$ 6.5	USS6.5
Engine fuel	US\$ 4.2	USS 4.2
Total running costs per day	US\$ 465	USS 317

US \$ = 1800 Uganda shillings 25/9/2000

Table 1b. Identified possibilities/constraints for cooperative use of research and training vessels - Uganda.

Institution/Department/Organization e.tc	Nationality		Regionally		Comments
	Possibilities	Constraints	Possibilities	Constraints	
FIRRIILVFRP	High	Constant breakdown	High	Constant breakdown	The vessel operates well in deep open waters and is stable
FTI	High	Financing problems	N/A	N/A	Essential to expose students to practical training on the lake
UFFCA	High	Regular flow of funds			Will contact donors for financing training courses in remote Islands
MUK (Zoology)	High	Regular flow of funds	High	Regular flow of funds	An important move in research facilities on the lake.
FRO	Urgently needed	Sustainability of funding	Urgently needed	Sustainability of funding	Need establishment of an authority for Uganda instead of FRO
FIRRI/LVEMP			High		The sharing of vessels would ease LVEMP constraint of lack of vessels
NSI			High	Project not written up yet	A useful idea where NBI could participate
DWD (LVEMP)	Wanted urgently but need terms spelt out	Not very easy to have a vessel readily available when needed	Welcome move	Plans not put in place yet	LVEMP has no vessel at its disposal though with a budget for L. Victoria research
LVFO			high	Would be due to institutes utilizing vessels when needed by LVFO	Long overdue vessels should be serviced and to be equipped with modern equipment
MUK (Zoology)	Very high	Project funding does not come on time or donors do not release funds as required			Funds available. the department will use the vessels

than 30%. Fish yield in Uganda by 1994 was dominated by the Nile perch (46%), tilapiines 36% , and Mukene (*R. argentea*) 5.60/0 (EPRC-MUK, 1999). In 1999 (MAAIF communication) Nile perch contributed 40% , Tilapiines 37/0; Mukene 5%, *Bagrus* sp 4% and the rest 14/0.

The fishing industry in Uganda employs about 0.5 to 1 million Ugandans. The fishing industry has become an important foreign exchange earner which in 1996 was second to coffee in export earnings estimated at US\$ 45million mostly coming from the lake .Victoria where 11 industrial fish processing plants were licenced but only 8 are presently operational. These plants, between 1990-97 operated below the approved processing capacity of 37,000 mt (EPRC-MUK, '1999). The fish fillets and maws are being exported to European Union and some other foreign countries. Artisanal processed fish in Uganda (salted, sundried, smoked) is also exported to neighbouring countries of ORe, Kenya, Sudan, Rwanda and to a lesser extent Tanzania.

The major fishing gears on Uganda water bodies are *gill* nets of varying mesh sizes. Others include hooks (angling or longline), cast nets, seine nets, mosquito nets and traps. Different gears, gear sizes, fishing methods tend to target different fish species.

The most popular gill net mesh size on L. Victoria for example is of 6" (Muhoozi, 2000 Frame Survey personal communication) targeted the Nile perch which formed 62% of the artisanal fishery and mosquito nets target *Rastrineobola argentea* the third most important species which formed 13% of the *commercial* fishery. Nile tifapia contributed 23% of the commercial fish catch on L. Victoria in 1995 (EPRC - MUK, 1999).

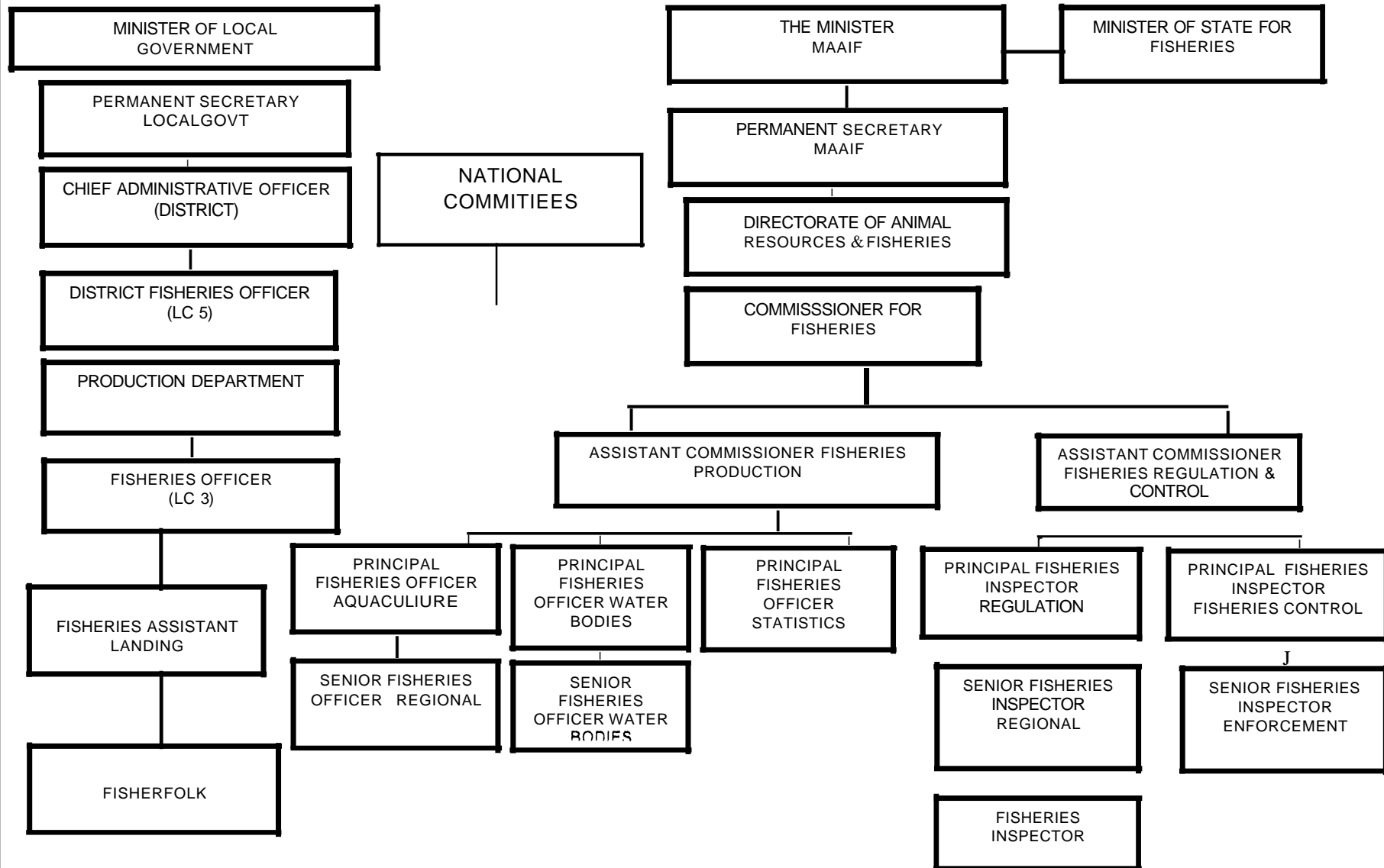
Aquaculture

The fishery in Uganda is based on about 42.383km² of lakes, rivers, swamps, dams and fish ponds. There are about 4000 fish farmers with close to 2000 ponds in a total area of 125 hectares. Aquaculture started in western Uganda around 1931 and again in 1951 with stocking of western Uganda minor lakes which had been unproductive (Owori-wadunde, 1999). The annual fish catch from ponds in estimated at 81 mt which is less than 0.1 % of annual fish harvest.

Fish Marketing and Trade

The fish marketing policy in Uganda encourages a wide range of pre-packed or packed value added fishery products for more competitive marketing. Fish is traded as fresh, frozen, filleted, smoked. chilled, salted or sundried. Other products like fish skin (**Nile** perch) oil and animal feeds are exported to various markets.

FIGURE 2. ORGANISATION STRUCTURE OF THE FISHERIES SECTOR IN UGANDA



Fisheries Management (Capture & Farm Fish)

The policy in fisheries management is to promote fisheries management in a sustainable manner involving participation of stakeholders at all levels to maximise the benefits accruing from the industry. Fisheries management in Uganda involves design and implementation of measures to monitor and control all aspects of the fisheries industry operations. This involves development of adequate and skilled human resource in the technical and managerial disciplines in both **private** and public fisheries sector.

The substantive law that provides for the regulation of the Uganda Fisheries is the "Fish and Crocodile Act" 1964 presently changed to "Fisheries Act". But this act has been overtaken by events both in administrative circles and changes in the fisheries (Kamanyi, 1996).

The act by current standards is neither comprehensive enough nor flexible enough to provide for the proper management and conservation of fisheries. The act now known as the "Fisheries Act" is in the process of being revised. It will also take into account the gender and equity issues and create a conducive investment environment in the fisheries sector.

Structure of Fisheries Administration in Uganda

In Uganda, the development and management of fisheries resources is carried out at the central government level and the district local authorities. The organisation chart is shown in Fig. 2. (Courtesy of Prof. Bwathondi, Dr. R. Ogutu-Ohwayo and Mr. J. Ogari, Fisheries management plan framework for Lake Victoria, Draft report No.2, 2000). At the centre, fisheries development and management is vested in Fisheries Resources Department (FRD) of the Ministry of Agriculture Animal Industry and Fisheries (MAAIF). The department is responsible for the formulation of policies in the fisheries sector, development of national plans and strategies, monitoring and supervising the performance of the decentralised fisheries functions. In FRD, is a zonal protection fisheries officer who is a FRD staff member with lake-wide responsibilities of law enforcement on main water bodies in the zone.

Fisheries extension has been divested to the districts. The districts are under the local government. District Fisheries Officer (DFO) is answerable to the department of production of the district which is headed by the Secretary for Production. The DFO is answerable to both the Chief Administrative Officer (CAO) and the secretary for production. The fisheries activities at the district are salary funded by the districts.

Fishing fleets

The total number of fishing fleets on all the Ugandan waters is not well known. However, on L. Victoria (Muhoozi, Frame Survey 2000, personal communication) there is an estimated 16,000 crafts. Rafts form < 0.1%, dugout (1.8%), parachute (34.6%) Ssesse (63.4%) and other crafts (0.2%). Of all the crafts 13% are motorized. On Lake George (Ogutu-Ohwayo *et al*, 1997) 547 fishing canoes were counted from the gazetted fish landings. These were either flat bottomed or parachute. The size range of canoes on the lake was 4.7 to 8.8m but varied slightly between the landings. All the canoes were propelled manually by two men.

On Lake Kyoga (FIRRI Frame Survey, 1997) 6501 canoes were recorded. About 30% were dugout canoes, 53% were parachutes and 44% were Ssesse planked canoes. On L. Edward and Kazinga Channel about 350 canoes are in operation. Though the percentage of different fishing gears on various water bodies is not known, gill nets dominate the fishery. Others include hooks (longline, angling) mosquito nets, seine nets, traps and cast nets. The estimated commercial fish catch (1999, MAAIF personal communication) on Uganda water bodies are summarized in Table 2.

The total commercial catch was estimated at 226,097mt with Lake Victoria contributing 46.1% of the catch. Nile perch (39.5%) was the major commercial fish species by weight.

Operational areas

The fishing activities are carried out on lakes Victoria, Kyoga, Albert, Edward and George and on about 160 minor lakes scattered all over Uganda mainly in western, south western and eastern Uganda (Fig. 1). There are also numerous rivers, swamps dams and ponds where there is active fishing. The aquatic systems are undergoing changes due to human impact, climatic changes and threats which are rampant like the water weed, pollution, eutrophication e.t.c.

Data that has been gathered for some of the aquatic systems in Uganda (Ogutu-ohwayo, 2000) indicates that the country is rich in aquatic biodiversity. Up to 55 algal species, 62 species of macro-invertebrates, 280 species of fish, 17 species of amphibians, 18 species of reptiles, 16 species of mammals and 155 species of macrophytes are present or associated with aquatic systems of Uganda. This aquatic wealth is however being impacted by many factors which should be addressed if they have to continue serving the society.

Table 2a. Estimated fish production on Uganda water bodies

Water body	Tonnes	Percentage
Lake Victoria	104,246	46.1
L. Kyoga	81,116	35.9
L. Albert	29,065	12.8
L. Edward/George	7,431	3.3
Minor lakes	4,239	1.9
Total	226,097	100

Table 2b. The major commercial fish species on Uganda water bodies

Fish species	Tonnes	Percentage
Nile perch	89,203	39.5
Tilapiines	84,539.5	37.4
Mukene/Dagaa (Omena)	11,409	5.0
<i>Bagrus</i> spp	8,564	3.8
Others	32,381	14.3

Research and training vessel capacity

There are two research vessels in Uganda at FIRRI Jinja. These are RV IBIS and RV MPUTA. Though lacking some of the equipments essential for navigation and safety on the water, the boats could be availed for use when there is need. The technical description and status of the vessels are shown in Tables 3a and 3b. Running costs for the vessels have been estimated (Table 1) and Table 2a shows the estimated costs for use of the different vessels. RV IBIS and RV MPUTA require US \$ 465 and US\$317 per day respectively assuming 9 hours of operation. This includes the crew, fuel, wear and tear maintenance and miscellaneous. RV IBIS (180HP) has been considered as a medium vessels and RV MPUTA (125 HP) as a small vessel. Both are used by the institute for at least 10 days per month.

Table 3a. Research and training vessel description - September 2000. RV IBIS • Location: UGANDA, FIRRI, Purchased in 1967 by
 FAO P.O. Box 343, Jinja, Tel: 120484 Fax: 120192 Email: firri@infocom-co.ug

Vessel description	Research/training facilities available	Safety on vessel	Capacity scientists & crew	Current Status and comments
<p>Overall length 17.1 m Beam width 4.9m Draught 2.4m Displacement 74.5m</p> <p>Main engine diesel 180 HP. 0333 Maximum speed 9 knots</p> <p>Radar - 16 mile radius(not accurate) Echo sounder (not accurate) Radio call - AEZ 1.6-30MHZ Compass</p> <p>Dynamo - 24 volt generator engine driven Emergency cooling pump for main engine Auxiliary engine (Lister) Winch (hydraulic pump driven) Emergency bilge pump petrol engine Anchor winch (not functioning) Mooring rope Spare anchor Fuel holding capacity 10.000L</p>	<p>Rador Radio call Echo sounder</p> <p>Otter doors and spares</p> <p>Search light Shower single - on side walk Fish hold (insulated to keep fish under ice) 2 tonnes capacity hydraulic winch to set and retrieve trawl net Fully rigged for bottom trawling 2 cabins (9 people) semi-detached. below deck. power supply. kitchen with gas cooker. wash basin cupboards. dining table. benches 2 toilets marine type</p> <p>Laboratory with washing basin. cupboards. power supply Bottom trawl net Pelagic trawl net for R. argentea (beam trawl) Cutlery</p> <p>Crew Skipper - 1, First officer - 1 Coxswain 2, Engineers - 2. Water pump - faulty</p>	<p>First Aid box Life jacket (16) Life raft 10-14 people Life boat</p> <p>Trained crew in life saving techniques Fire extinguisher</p> <p>Water pump</p>	<p>Scientists (5) Crew (8)</p>	<p>Rehabilitated by LVFRP No refrigeration Ice always taken on board .</p> <p>Presently used by LVFRP for stock assessment 10day/month would be available for 15days/month Running costs (maintenance per cruise 10days =US \$ 465 Grade of capacity use (1 year)</p>

Table 3b. Research and training vessel description - Selltenber 2000. RV MPUA - Purchased in 1985, with funds from ADP LOCATION: UGANDA, FIRRI, P.O. Box 343, Jinja, Tel: 120484 Fax: 120192 Email: firi@infocom.co.ug

Vessel description	Research/training facilities available	Safety on vessel	capacity scientists and crew	current Status and comments
<p>Single skin FRP multipurpose fishing vessel Overall length 13.17m Beam width 3.7m Draught 1.44m Engine power 120HP Displacement of water mt Main engine diesel Yamaha 125Hp Maximum speed 8 knots Generator 8HP Echosounder Spare anchor plus rope life raft Rigged for bottom trawling Cruising range 500 miles then the engine has to rest Compass Winch Radio call (poor type, not working) Fuel holding capacity - 4000l</p>	<p>Radar Echo sounder (old) Search light (faulty) 1 cabin with 4 bunkers Pulley arrangement for limnological vertical sampling Life raft Generator 8 HP Toilet --1 Kitchen with a table Compass Shower Ice holder Fish holder Store</p>	<p>Service engine 15HP Service boat Life jackets Life raft Life buoys</p>	<p>Scientists - 4 Crew - 4</p>	<p>No radio call Generator - need repair or replacement Radar - need repair or replacement Anchor rope Spare anchor plus rope Life raft Service engine Life jackets need replacement Basically for inshore waters Crew (needed) Currently available for LVEMP fish biology, limnology 10 days/months</p>

PROPOSAL FOR COOPERATIVE USE OF RESEARCH AND TRAINING VESSELS ON LAKE VICTORIA

Background

Lake Victoria (68,800km²) and adjoining catchment area (193,000km²) is an international water body that is of economic importance to an estimated 30 million people of the riparian countries of Kenya, Tanzania and Uganda. The lake is also of great scientific and cultural significance to the global communities mainly in respect of its water uses, biodiversity and fisheries. The policy of the riparian states focuses on sustainable use of aquatic and biological resources and environmental quality maintenance. For sustainability of the lake's resources therefore, the carrying capacity of the natural lake environment must be understood and respected. The natural resource richness and a healthy environment should prevail as a fundamental basis for sustainability of the lake resource. The lake has many uses. It is a source of foreign exchange and direct and indirect employment, it is used as a source of food, energy, drinking and irrigation water, shelter for aquatic organisms, transport and a repository for human, agricultural, municipal and industrial waste. The lake provides a livelihood to about a third of the combined population of the three riparian states (EPRC, 2000) with the population of the three countries growing at about 6% per annum, which is among the highest in the world (World bank, 1996) the multiple activities in the basin have increasingly come into conflict resulting into substantial changes in the lake ecosystem. It is therefore essential to make any planned development sustainable. The riparian states bordering the lake have agreed to cooperate in regional research and management of the lake. This is reflected in the two projects (LVEMP & LVFRP) which are being conducted on the lake basin and the formation of LVFO to coordinate the activities on the lake.

The research being conducted on the lake includes those of aquatic biodiversity, fish biology, fish stock assessment, fisheries limnology, water quality and movement (hydro-dynamics), water meteorology, socio-economics and management options.

Justification

Research vessels have been found to be very expensive both in capital and operating costs. Eddie (1983) established annual costs of a research vessel at an average of 35-55% of the original capital costs of the vessel. Ramster (1984) disapproved owning of research vessels by institutions, not adequately funded. Patrick Alleyne (1986) proposed, that a cost-effective approach of satisfying institutional research needs is by cooperative use of research vessels or vessels of opportunity. Before the collapse of the East African Community in 1977, the Freshwater Fisheries Research was a combined research effort of the three East African states with the headquarters at Jinja in Uganda as East African

Freshwater Fisheries Research Organisation (EAFRO) with the substations at Kisumu in Kenya and Mwanza in Tanzania. The running and maintenance of research including research vessels was a duty of the riparian states. Large, medium and small crafts were used. Large vessels ventured in deeper open rough waters e.g. in stock assessment, limnology and possibly general hydrodynamics of the water. In addition smaller boats were used to sample in the shallower waters of the lake.

Limnological and fisheries sampling need coverage of the entire lake. The water quality research entails, for example, water department to survey the whole of Lake Victoria which is a very huge lake. It is adequate to know the water quality of the entire lake using a variety (sizes) of vessels. The fishery and biodiversity of the lake is not confined to inshore waters but appear also in the open. Therefore, both small and large vessels, are required. After the collapse of the EAC some of the formed national institutions received some assistance to maintain the research vessels but lacked skilled manpower. After reduction or termination of the assistance by the donors, most vessels were out of service for several years either due to lack of funds or skilled man power. LVFRP came in and is assisting in fish stock assessment of Lake Victoria and LVEMP on Fish biology and biodiversity both projects with limnological and socio-economics components. The institutes have through LVFRP acquired research vessels or had them repaired. In addition to the research vessels on the lake, there are vessels known as "vessels of opportunity" dealing in cargo and passenger on their routine voyages. With proper arrangements, these could be utilised especially in limnological work and bathymetric mapping.

Presently, there is increased requirements from governments, institutions of higher learning, relevant ministries and departments, international bodies, NGOs etc for both research and development of fisheries, environment as well as education and training of skilled manpower in fisheries and related aspects of science. The two projects of LVEMP and LVFRP (LVEMP has no vessels of their own) have injected funds in procurement/maintenance of the research vessels of the three research institutes but the projects may soon be ending. The institutes after the end of the projects will still be needing the services of these vessels and non will have sufficient funds to justify individual ownership or operational costs to fulfill the activities in place. The result will either be under utilisation of the vessels or grinding of the vessels.

In May 1996, LVFO with its headquarters at Jinja-Uganda was established by FAO to coordinate research and management on Lake Victoria. The East African Corporation (EAC) formed recently by the heads of state (Kenya, Tanzania and Uganda) with its headquarters now in Arusha -Tanzania- was established to address research and training in marine science and fisheries among other functions. The cooperative use of research and training vessels would therefore, be timely in the region.

Objectives of the proposal on Cooperative use of Research and Training Vessels

To carry out a feasibility study on the possibilities for cooperative use of research and training vessels from Kenya, Tanzania and Uganda operating on Lake Victoria as a means of providing ship time of these specialised vessels at affordable cost to institutions in need of the services, resulting in better utilization of these costly vessels.

Expected outputs

Information on:

- Number of vessels available in Uganda, condition of vessels, capacity, facilities for training and research
- Ship time
- Institutions in need of using the specialised vessels
- On-going and planned research and training programmes needing the services of vessels
- Running costs and maintenance of vessels
- Whether these vessels could be cooperatively utilized to minimize on running and maintenance costs at affordable costs.

Way forward in Cooperative use of Research and Training Vessels in the region

There is need for information on:

- The number of vessels and location (large, medium, small) in the region, their condition, capacity, facilities available for research and training, status of the crew;
- Vessel time available for on-going or planned research and training activities on the lake;
- Whether the number of vessels are sufficient for use by the interest groups in cooperative use and vessel specialties;
- The running costs and maintenance involved;
- Whether individual institutions owning the vessels have sufficient activities and funds to justify ownership of running the vessels without outside co-operation or assistance;
- Research undertakings in the region that need use of vessels;
- Ownership of vessels of "opportunities" number and how and under what conditions they could be utilised;
- Whether ship time can be given to those in need of vessel services at affordable cost;
- Mechanism for coordination of research and training vessels in the region;

- Arrangement for long term cooperative use of research vessels and implementation;
- How to overcome constraints like cross board movements and terms of usage of the vessels

PROPOSAL FOR JOINT RESEARCH PROGRAMMES ON LAKE VICTORIA

Background

Research on biodiversity and management of the aquatic systems of Lake Victoria basin is a major policy of the riparian states of Kenya, Uganda and Tanzania. During the recent years, the lake biodiversity has been damaged as a result of human activities. The lake has been heavily polluted from land-based industrial and domestic discharges, infestation of the lake by water hyacinth, erosion, high siltation due to poor agricultural practices, *illegal* fishing practices' in exploitation of biological resources' and introduction of Nile perch in the system. To address these constraints, research institutions in each of the riparian states conducted individual researches to solve the constraints. These researches were dictated by among others; political, geographical boundaries and socio-economic atmosphere of individual states.

The signing of a treaty for East African Cooperation (EAC¹), the establishment of LVFO and the present projects (LVEMP, LVFRP) have marked a holistic regional approach to rehabilitate the lake ecosystem for sustainable utilisation of the resources in the lake. International researchers and bodies have taken interest in carrying out research on the causes of numerous changes on Lake Victoria ecosystems.

Justification

Flora and fauna, biodiversity, pollutants and discharges into the lake and causes do not recognise territorial boundaries. Siltation, erosion are usual phenomena. Introduced fish species and illegal exploitation of the fishery resources are not constraints of one state. The impact of man on the ecosystem has created problems in sustainability of the Lake Victoria ecosystem.

Regional research programmes to harmonize efforts geared towards reversal of increasing fishery and environmental degradation would be a welcome milestone in sustainability of the lake ecosystem. Meaningful research on the lake needs:

- Harmonisation of data collection and sampling procedures;
- Standardisation of statistical methods for **biological**, socio-economic and environmental data and cross calibration of scientific instruments;
- Cross-fertilization of ideas among the riparian states and scientists;
- Cost effective use of research vessel and reduction in number of scientific equipment, scientists and crew thus reducing on national expenditure;
- Uniform database and interpretation.

The riparian states have agreed to cooperate in research and management of Lake Victoria aquatic resources through LVFO coordination. The researches

undertaken include: fisheries, limnology, fish stock assessment, water quality and movement, meteorology, human impacts on living resources and aquatic environment, climatic changes and changes which are rampant like the water weed, pollution, eutrophication which are affecting sustainability of the fishery yield in the lake among others. Lake wide surveys e.g acoustics has already or is being carried out under a joint programme. The threats to sustainable fishery and aquatic environment has among other factors come up as a result of lack of highly integrated regional research programmes on the lake to address the problems. The present LVEMP and LVFRP are addressing some of the joint research programmes on the lake. But, before the end of these projects a system has to be put in place to address the issues of joint research programmes. The presence of LVFO and its scientific committee could address this.

Objective for Joint Research Programmes

To justify the need for joint research programmes on Lake Victoria for harmonised research outputs.

Expected Outputs

- Research programmes that could be done jointly;
- Cost effectiveness of joint programmes;
- Strategies and plans for implementation of joint research programmes;
- Collaborative arrangements with international researchers in research programmes which could be easily funded by international bodies like FAO or other United Nations agencies.

References

- Bwathondi, P.O.J, Ogutu-Ohwayo, Rand Ogari J., 2000. Fisheries management plan. Framework for Lake Victoria. A draft report 60pp.
- Eddie, G. C, 1983. The ownership and management of fishery research vessels. FAO. *Fish Tech. Pap* (237: 46p).
- EPRC - MUK, 1999. Capacity building for integrated environmental considerations in development planning and- decision-making with particular reference to the fishing industry in Uganda. Economic Policy Research Centre (EPRC), Makerere University Campus. Pp 219.
- Fisheries Research Institute Mandate structure and activities 1999. Occasional Publication No.1: Edited by Drs J. S. **Balirwa** and F. W. Bugenyi. Pp20.
- Hecky, R.E, and P. Kilham. 1988. Nutrient limitation of phytoplankton in freshwater and marine environments. *Limnol. and Oceanogr.* 33: 796 - 832.
- Kamanyi, J.R. 1996. Socio-economics of fishing communities on Uganda water bodies. Mimeo 25pp.
- LVEMP, 2000. Community participation in fisheries management. Background information. **Published** by LVEMP Executive **Secretary** - Entebbe - Uganda.
- MAAIF**, 2000. The National Fisheries Policy. A draft report 24pp.
- NARO, 1998. Technology Development and Transfer Nationwide Survey. Pp170.
- National Agricultural Research Organisation (NARC), 1996/97 Annual Report. Pp 57-66.
- Ogutu-Ohwayo, R. the status of aquatic biodiversity in Uganda. Its conservation and sustainable use. FIRRI/LVEMP Monograph.
- Ogutu-Ohwayo, R., J. R. Kamanyi, S.8. Wandera, R. **Amiina** and F. Mugume, 1997. The fisheries and fishstocks of Lake George: their prOductivity, exploitation, management and conservation. A report prepared for the Queen Elizabeth National Park fishing village conservation project. CARE International Uganda.
- Orach-Meza, F. 1996. Comments by Commissioner for Fisheries! Discussion draft on the Fisheries Department (unpublished).

Owori-Wadunde, 1999. Concept paper for aquaculture research and development in Uganda. Fisheries Research Institute (FIRI) Uganda.

Patrick Alleyne, E. 1996. Report on the workshop on cooperative use of research and training vessels in the East African Region.. FAO/COSTECH. Pg 52-57. Dar es salaam, 20-24 May, 1996.

Ramster, J. 1984. Making the most of your fishery research vessel. FAO Fish. eire 779. 46p.

The National Agricultural Research Organisation (NARO), Fisheries Research Institute (FIRI) 1996/97 Annual Report. 56pp.

Tumwebaze, Rand E.J. Coenen, 1991. Report on the Frame Survey conducted in the Uganda part of Lake Victoria (3 September - 20 December 1991). FISHIN Notes and Records. Fisheries Statistics and Information systems. FAO/UNDP Project UGAI87/007.

Appendix I. Cooperative use of research and training vessels - Uganda: Institutions/Departments/organisations and persons contacted

Name of institution / Department/ Organization etc	Persons interviewed	Title	Address	Comments
FIRRI	Dr J.S. Balirwa	Senior Research Officer	Box 343, Jinja	A welcome idea
"	Mr. J.O. Okaronon	Senior Research Officer	Box 343, Jinja	A welcome idea
"	Mr. O.K. Odongkara	Senior Research Officer	Box 343, Jinja	A welcome idea
"	Mr. L. Muhoozi	Research Officer	Box 343, Jinja	A welcome idea
"	Dr. T. Twongo	Principal Research Officer	Box 343, Jinja	A welcome idea
LVFRP	Mr. G.-Passiotis	LTIA	Box 343, Jinja	A welcome idea
LVFRP	Mr. J. O. Okaronon	Research Officer	Box 343, Jinja	Vessel available
UFFCA	Mr. S. Kamuturaki	Chairman	Box 25494, Kampala	Trainers available
FTI	Mr. D. Kibwika	Principal	Box 124, Entebbe	Would like to train the students using the vessels
MUK (Zoology Opt.)	Dr. Y. Kiziito	Head of Department	Box 7062, Kampala	Good plan to minimise on costs and improve on capacity building
DWD	Mr A. Matovu	Task leader, Eutrophication - LVEMP	Box 19, Entebbe	This is what is needed.
FRO	F.X.M. Kiiza	Assistant Commissioner	Box Entebbe	Plans underway to cooperate regionally in Lake Victoria fisheries management
FIRRI	Dr.Ogutu-Ohwayo	Director	Box 343, Jinja	There is need to follow up the proposal and affect it.
LVFO	Dr. W.M Kudoja	Senior Scientist	Box 1625, Jinja	Vessels should be serviced and equipped
MUK (Zoology)	Dr. W. Mwanja	Lecturer	Box 7062, Kampala	Economical creates interactive atmosphere students go far out, plan is good for scientific interactions.
FIRRI	Mr. S.B. Wandera	Research Officer	Box 343, Jinja	Possible especially for the three institutes owning the vessels.