FISHERIES RESOURCES RESEARCH INSTITUTE

NATIONAL AGRICULTURAL RESEARCH ORGANISATION

WORKSHOP REPORT

ON

THE FISHERIES RESEARCH ON LAKE NABISOJJO – LUWERO DISTRICT

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A3.3 ALGAL PHYSICAL CHEMICAL CHARACTERISTICS OF LAKE NABISSOJJO AND THEIR RELATION SHIP OT THE FISHERIES PRODUCTION

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Introduction

Algae are microscopic plants in aquatic environments and include the Blue green (Cyanophytes), Green (Chlorophytes), Diatoms (Bacillariophytes), Dinophytes Chrysophytes. Several of these may be absent or present due to environmental limitations existing in a specific water body. Algae are primary producers in aquatic systems and are a major component of the aquatic food web. They are also an important source of the food for major fishes such as Tilapia. Changes in algal species composition and abundance may affect the fishery. Changes in the environment, especially nutrient concentrations and physical parameters, can also cause changes in algal species composition and abundance. Nutrients play a big role in all aquatic systems as they are among the basic requirement for algal production processes. However excess of these nutrients can be a nuisance in the system. Changes in these parameters may affect the fisheries production

Material and methods

Water samples were taken using a 3-litre capacity Van Dorn water sampler. The samples were immediately preserved with Lugol's iodine and kept out of light. Samples were examined under an inverted microscope at 40x magnification. Counting was done by means of a laboratory counter and species identification was done using appropriates keys. Samples for nutrient analysis were filtered through GF/F filter papers and preserved with HCL in the field and were taken to the laboratory were they were later analysed for Silicon, Phosphorus and Nitrogen using Stanton manual of fresh water analysis. The filter papers were used to determine algal biomass in terms of chlorophyll a using the cold methanol method.

In situ measurement of pH, Conductivity, Temperature and Dissolved oxygen were taken using portable meters. Light transparency was measured using both the Secchi disk and a light meter.

Results.

Species composition and distribution

A total of four classes of algae (Cyanophyta, Bacillariophyta, Chlorophyta, and Euglenphyta) were encountered as as listed in Table 1.

Chlorophyta was numerically abundant class of algae inshore and Bacillariophyta the abundant offshore.the latter was also the most abundant overall (Table 2).

Higher diversity of species was observed inshore (28) than offshore (table.1& 3). There was a greater distribution of species in algal classes inshore compared to off shore. The Solitary filamentous Blue green algae of the genus *Planktolyngbya* occurred in both inshore and offshore areas. The mucilage bound blue green algae (*Microsystis*) abundant inshore .The diatoms (Bacillariophyta) were well represented in the entire lake. And of these *Aulocosira* was the most dominant species offshore compared with inshore.

Physico-chemical characteristics

High mean oxygen levels (>5mg/l) were observed in the surface water (1m) while less dissolved oxygen levels (<3mgl) were observed below 1m depth. Mean secchi reading in the rage of (0.8-0.88m) were recorded in both in shore and off shore.(Table 4and 5.) The pH level ranged from (7.4- 8.5) in shore and (7.06-7.7) off shore (Table 4 and5.)

The mean inshore temperatures were higher than the offshore by 0.1 °C. The lake was richer in the nutrient inshore as opposed to offshore (Table 1). Chlorophyll levels were generally high both inshore and offshore (Table 4& 5).

Discussion

Algal species composition and diversity is known to change seasonally in response to variations in light and nutrients availability (Reynolds1984,1986,1990;Talling 1987;Kling *et al* 1997) . The light and nutrient environment in this lake are considered to be edequate to support algal production processes hence the fisheries production.

The shallow depth of the lake facilitates constant mixing resulting in both the surface and bottom waters to be well-oxygenated and breaking down stratification in this lake. As well as enabling rapid nutrient return in the water column which enhances algal production. Algae have basic metabolic requirements for nutrients in relatively fixed proportions and most algae have maximum growth near the Redfield Ratio of C:N:P 105:16:1 (Goldman et al.1079,Heckyand Kilman 1988). But individual algal species and communities can grow, within different ranges of nutrient stoichiometry, which deviates from the Redfield Ratio and achieve optimal growth. algal species will therefore,be limited if the cellular nutrient concetration falls below that required to sustain its growth. also ,nutrients may predict the out come of competition, among algal species when nutrients become limiting.

The dominance of Bacillariophyta offshore may be function of the high level silicon as observed (Table 6and 7.). In Lake Victoria, in the passed, high Melosira (*Aulocasira spp)* occurrence was associated with the *O.esculentus* which was then deriving the back of its nutrition from Diatoms(Talling 1987). The dominant *O.esculantus* fishery in Nabissojjo and the dominant occurrence of the Diatoms in L.Nabissojjo confirms the correlation between the two biological components. Therefore there are good prospects for the *O.esculentus*, fishery in the lake.

References

C.S.Reynolds 1990 : The ecology of fresh water phytoplankton.

Table 1: Speceis diversity both inshore and off shore
P = present

Taxon	Inshores	Offshore
CYANOBACTERIA		
Merismopedia tennusima	P	
Anabeanopsis	P	P
Microsystis aeruginosa	P	P
Anabeana circinalis	P	
Planktolyngbya cirmucreta	P	
Planktolyngbya spp	P	P
Cylindrospermopsis africana	P	
Microsystis flos-aquae	P	
Chroococcus spp	P	P
Aphanocapsa spp	P	P
Merismopedia spp	P	P
CHLOROPHYTA		
Tetradon spp	P	P
Tetradon trigonum	P	P
Ankistrodesmus falcatus	P	P
Cruciginia	P	P
Scenedesmass	P	P
Cosmarium depressum	P	
Phacus longicauda	P	P
Staurastrum	P	P
Monorophidium		P
BACILLARIOPHYTA		
Cyclotella spp	P	P
Aulacosira spp	P	P
Fragiralia spp	P	P
Synedra spp	P	P
Navicula spp	P	P
Nitzchia spp	P	P
EUGLENOPHYTA		
Trachelomonas spp	P	P
Euglena acus	P	P
PROTOZOA		
Ciliates	P	P
Total	**28.0**	**23.0**

Table 2: The relative abundance of algal classes expressed as overall mean percentages by number.

Classes	Inshore	Offshore
Cyanophyta	26.9	11.5
Chlorophyta	28.2	27.9
Bacillariophyta	21.8	55.8
Euglenophyta	19.2	3.6
Protozoa	3.8	1.2

Table 3: The number of algal species encountered in each algal class

Classes	Inshore	Offshore
Cyanophyta	11	6
Chlorophyta	8	8
Bacillariophyta	6	6
Euglenophyta	2	2
Protozoa	1	1

Table 4 .The physico-chemical parameters offshore of Lake Nabissojjo.

Parameters	Cond (us/cm)	Temp (Deg C)	Do (mg/l)	pH	Secchi (m)
Mean	99.7	25.28	4.54	7.4	0.84
Max	100.7	25.9	7.9	8.5	0.88
Min	95.3	24.2	4.4	7.4	0.79

Table 5 .The physico-chemical parameters Inshore of Lake Nabissojjo.

Parameters	Cond (us/cm)	Temp (Deg C)	Do (mg/l)	pH	Secchi (m)
Mean	98.6	24.9	5.5	7.7	0.75
Max	108.3	26.0	7.6	7.53	0.8
Min	91.3	24.0	2.54	7.06	0.7

Table 6 The Nutrient concentration expressed as mean, Maximum and Minimum for inshore of Lake Nabissojjo.

Parameters	NO2 (ug/l)	NO3 (ug/l)	NH4 (ug/l)	SRP (ug/l)	TDP (ug/l)	TP (ug/l)	SRSI (ug/l)	Chlr-a (ug/l)
Mean	5.5	12.2	21.5	11.9	23.9	116.1	7398.0	145.1
Max	43.8	16.9	30.7	16.3	30.0	127.8	9201.9	236.3
Min	6.7	7.5	11.8	6.3	16.3	103.8	5589.4	34.8

Table 7 The Nutrient concentration expressed as mean, Maximum and Minimum for offshore of Lake Nabissojjo.

Parameters	NO2 (ug/l)	NO3 (ug/l)	NH4 (ug/l)	SRP (ug/l)	TDP (ug/l)	TP (ug/l)	SRSI (ug/l)	Chlr-a (ug/l)
Mean	4.9	10.4	11.2	9.6	25.2	113.1	7256.0	159.9
Max	6.7	14.8	19.6	12.5	30.0	129.8	1066.9	229.4
Min	2.9	5.4	5.1	5.0	22.5	103.0	5758.1	104.3

The arable land is used for farming while the rest is used for rearing animals. The forest reserve is an important source of firewood, timber and also helps in moderating the weather besides other several uses. Sand is mined for sale to local developers in the nearby trading centres.

However, some of these natural resources have been over exploited such as the land, sand mines, wetlands and forests or under-utilised such as the lake. Those that have over exploited are faced with serious degradation.

The Nabisojjo communities are involved in several economic activities. These include: livestock keeping (pastoralists), crop farming and trade in dairy and other animal products. Secondary sources of income include retail shops, trade in farm produce, charcoal burning and fishing. The members of the focus group were asked to describe and explain the activities through which they made a living. They were also asked about how they utilised their incomes. Matrices showing the various ways in which incomes are spent were drawn. Seasonal calendars showing the peaks of some of the activities were drawn (see Fig 3 and 4)

Crop farming

Farming in these communities is dependent on rainfall. This has been low in recent years, and it is predominantly for subsistence purposes, although some surplus is sold. Crops grown include cassava, beans, sweet potatoes, bananas, and coffee. There is basically one farming season and land holdings are small and fragmented. Fishermen usually farm when the catches are low.

Food is available in their right quantities depending on the seasons (peak or low seasons-rain seasons and drought seasons). Some families go with one meal in the months of January - march. This is usually a critical period when food is imported from other sub-counties that have food. During this period some families resort to hunting wild animals like, water bucks, Buffaloes, wild pigs and hippos. Families with livestock sale it to sustain their families during these critical times.

The are a number of constraints faced in food production. These include:

- Poor attitude towards farming by the local communities. They are more inclined towards livestock keeping. Most farmers do it for subsistence.
- Poor climatic conditions experienced for the last three years.
- Pests and diseases, notably cassava mosaics, potato weevils, elephants, monkeys and wild pigs.
- The high cost of agricultural inputs, especially the improved seeds.
- Inadequate facilitation of the departmental staff, particularly the extension staffs.

The department has undertaken efforts to improve agricultural production in the District through sensitisation on crop production. There are also a number of NGOs and other Government organisations that have contributed to improved agricultural production. These include SASAKAWA Global 2000, VEDCO, Plan International, BUCADEF, CCF and World Vision. These have helped by directly financing and training farmers, intensifying crop husbandry systems and reduction of post harvest losses.

Livestock rearing

This is an important economic activity. This community is comprised of pastoral ethnic groupings, notably the *Banyarwanda, Banyankole* and *Barundi*. Animals are sold when it is really necessary, otherwise these communities are renown for overstocking. The dairy products are an additional source of household income. The are a number of constraints faced

in livestock rearing. These include; diseases such as foot and mouth disease and the long drought seasons that have hit the country in recent times.

Fishing

Fishing and associated activities such as processing and trading are really not taken in high regard as serious sources of income. Members of the focus group described how they earned more income from other activities other than fishing by drawing a pie chart (see Fig 5). There are only five fishermen on the lake, three boat owners and two crews. The fourth boat belongs to the district for use in sampling. The most common fish species landed are mamba, male and Ngege. There is small-scale fish trade going on. All the fish is sold fresh, since there is really not much left for processing. There is a high demand for fish but with low supply. Communities expressed their wish to have constant supply for fish. However, fishing activities are temporarily banned on Lake Nabisojjo. Those who are illegally fishing do not wish to expose themselves to the public. However before the ban, the fishers had two bicycle traders who would sell fish as far as Kakira, Katoke, and Jumwa in Wakyato sub-county. The fishers sale the fish in bundles for approximately Ushs. 500/=.

The fishing activities on the lake are hampered by the prevailing ban, floating vegetation, lack of suitable gears and generally the fish are stunted.

Other sources of income

Some members of the community own retail shops and restaurants. Bugongo and Kakiri centres are situated on the way to Ngoma and this is a major route into the hinterland of Luwero renown for cattle and dairy product traders. These usually have a stop over at these centres to purchase commodities. Cereals and other agricultural products are also traded in these communities, especially during the drought periods. Maize, sweet potatoes beans and horticultural products were being sold at the time of the study. Charcoal burning and sell of second hand clothes are also other important sources of income.

Gender roles in these communities

Men carry out the fishing. They also own all the fishing gear on the lake. Men also carry out the trade in fish. Men also dominate the administration of the villages and the beach in particular. Women are neither involved in fishing, processing or trading. They are involved in farming, livestock keeping and trade in dairy products. They are also actively trade in cereals, charcoal and second hand clothes. Some of the women cook and sale food in kiosks. Although the communities have a large number of orphans, due to the past instability, the fishery of Nabisojjo Lake has not yet 'attracted' child labour.

Fisheries management

Fishing activities have been banned temporarily to allow the growth of the stocked fish and research to be undertaken. There is no available statistics data on the fishery of Lake Nabisojjo. There are no community institutions/organisations involved in fisheries regulations. There are plans to tender the lake to private companies for exploitation.

Conclusion

The findings provide insights into the functioning of the Nabisojjo Minor lake communities and their interests, which could be useful in planning their involvement in the development of the fisheries and its management.

Figure 4 Seasonal calendars for farming and fishing activities

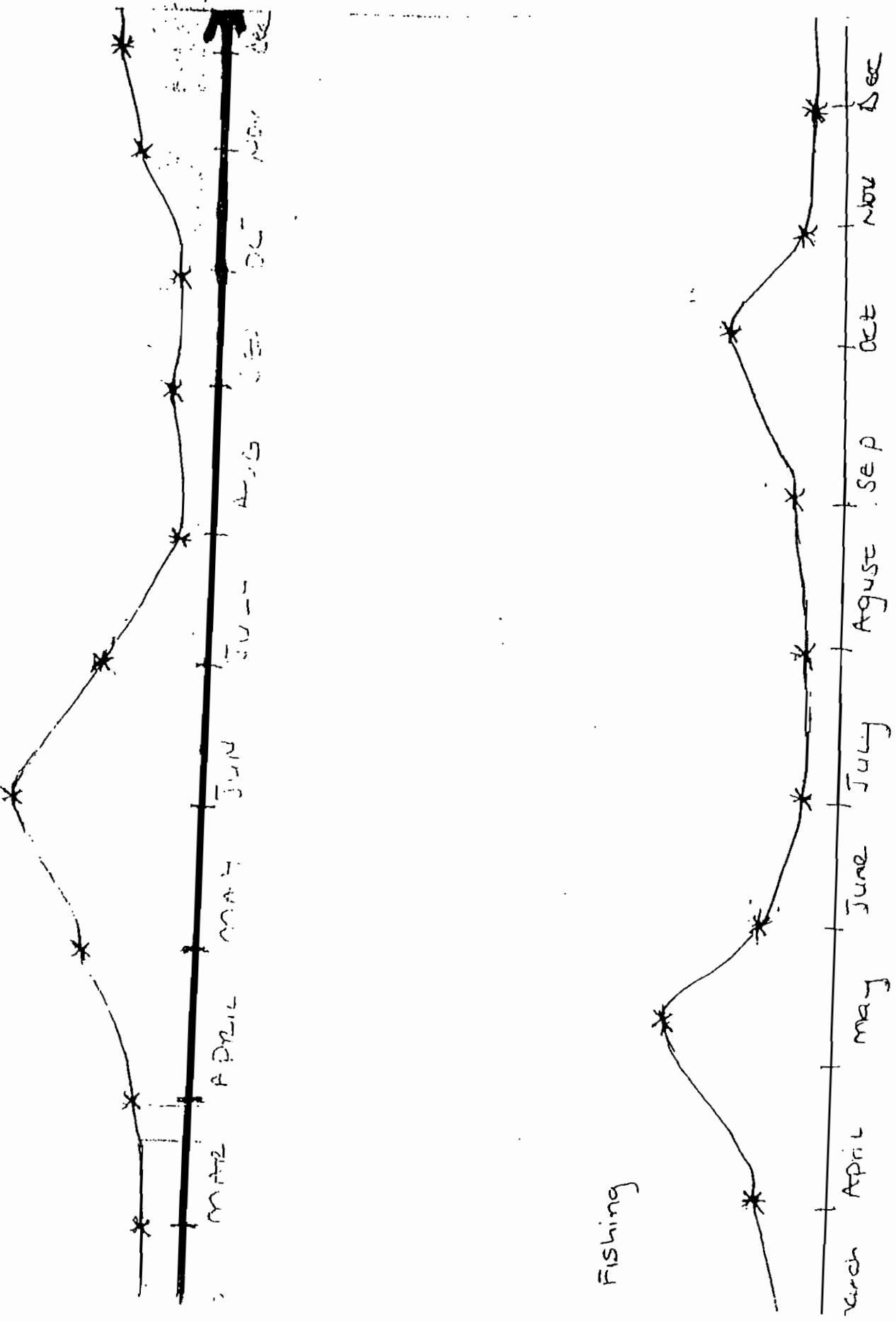


Figure 3 Matrices to show different expenditure of the income

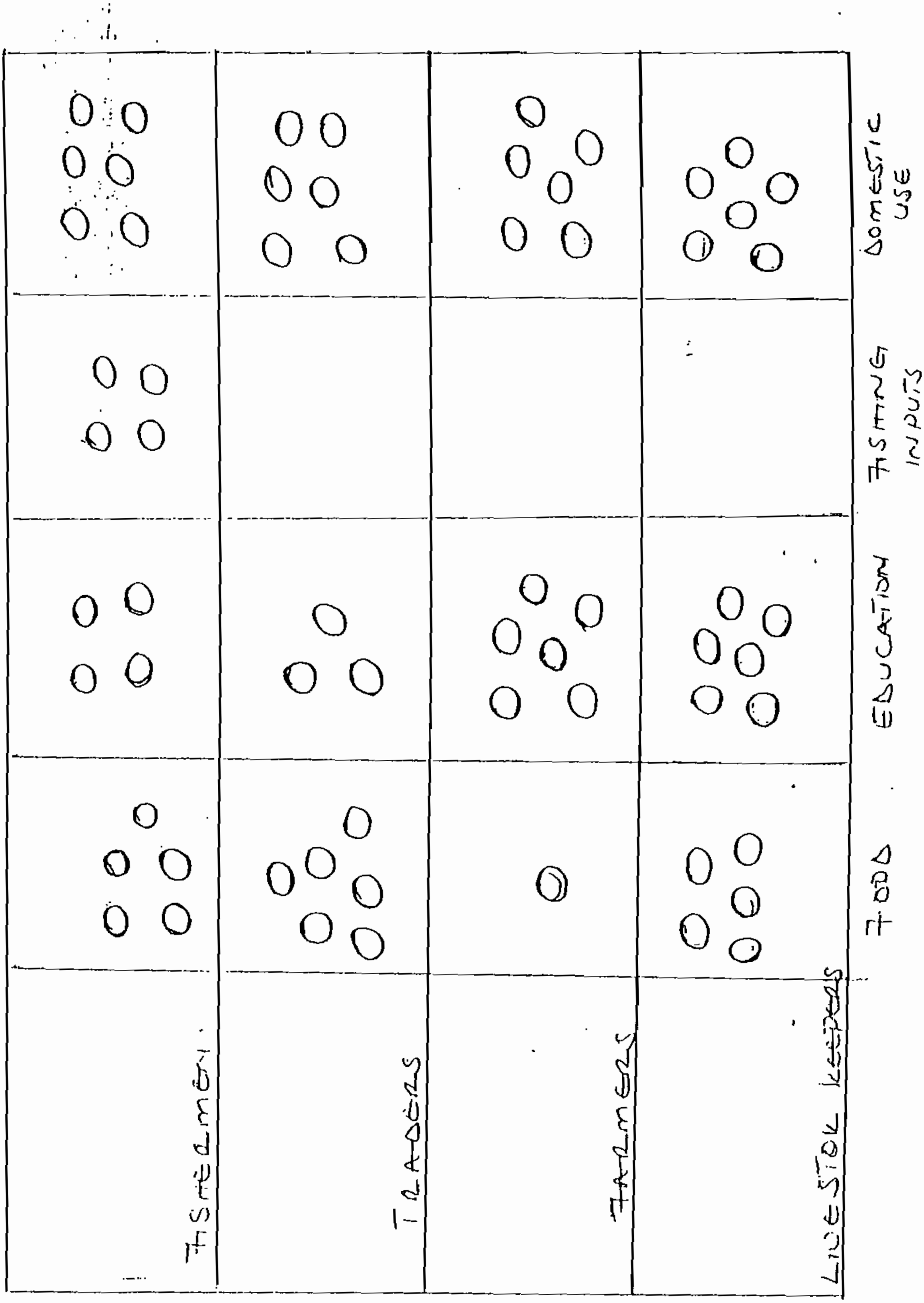
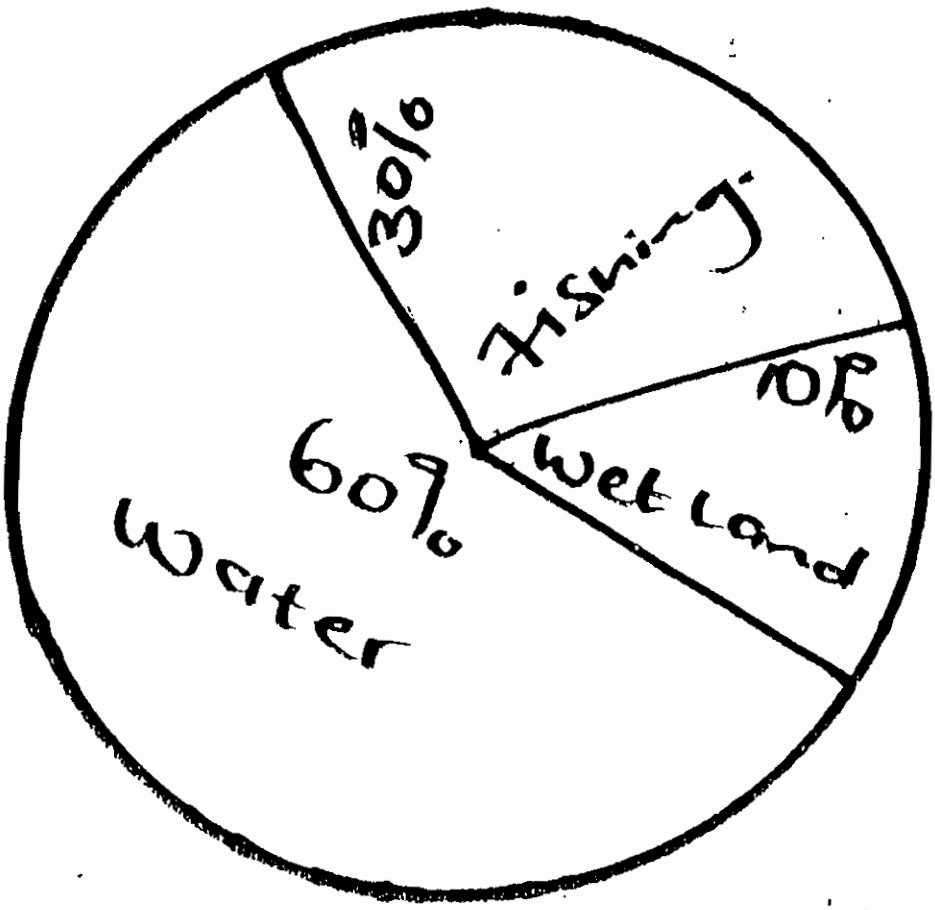


Figure 2 Pie chart drawn to show the uses of the Lake



A time line showing the historical background of L.Nabisojjo

FIG 1

1950s THE PRESENT NABISOJJO WAS A VALLEY USED AS A GRAZING GROUND.

1961. A ROAD WAS CONSTRUCTED FROM KAKIRI TO BUGONGO VILLAGE.

1964. AN OVER FLOW OF RIVER MAYANJA FORMED L. NABISOJJO.

1966. BAKENYE STARTED FISHING: MAMBA, MALE, NGEGE USING HOOKS.

1986. ESTABLISHMENT OF ARMY TRAING WING.

1988. A 70 Kilogram MAMBA WAS CAUGHT.

1989 — GEARS LIKE CASTNETS AND TYCOON WERE INTRODUCED.

1998. JUNE. MR. NADULI LAUNCHED A CAMPAIGN TO CLEAR SUDS AND STOCKED FISH FROM LAKE KYOGA.

1999 - MARCH 1st SAMPLING WAS DONE.

- JUNE 2nd SAMPLING WAS DONE.

- AUGUST 3rd SAMPLING WAS DONE.

- SUGGESTIONS TO TENDER THE LAKE TO PRIVATE COMPANIES OR ORGANISATION

Figure 5 Pie chart drawn to show the economic activities.