

# WATER HYACINTH IN THE 21<sup>ST</sup> CENTURY: A KEYNOTE ADDRESS

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## INTRODUCTION

Water hyacinth, *Eichhornia crassipes* is a serious aquatic pest in many parts of the world. The menace of the weed has reached alarming proportions in many countries. Its rapid growth has clogged major waterways and created problems associated with navigation, national security, irrigation and drainage, water supply, hydro-electricity and fishing in many countries. Its home base is the Amazon Basin in South America. Water hyacinth regarded as the most troublesome weed of the world has since been willingly or unintentionally aided by man in its dispersal and present distribution (Gopal and Sharma, 1981; Jayanth, 1987).

The first surge of the weed in Nigeria was noticed in September 1984 along the Badagry Creek in Lagos State where it formed a 'mat' over the water surface. By January 1985, it has spread to the creeks and lagoons in Lagos and its environs. Investigations by the University of Lagos team of scientists

revealed that the surge of the weed entered Nigerian water via the Porto Novo Creek (Benin Republic) which is connected to and flows into the Badagry Creek. Our prediction then was that if the immediate and adequate steps were not taken to check the weed, the Lagos Lagoon system would become the avenue for spreading the weed into other parts of the Nigerian waterways including Epe, Lekki and Mahin Lagoons (Kusemiju *et al*, 1985). By 1986, the weed had crossed the Lagos lagoon and has since covered most of the intricate system of waterways made up of lagoons and creeks along the coast of south-western and south-eastern parts of Nigeria.

Water hyacinth rapidly became a major problem in the ECOWAS region. The problem was most pressing in Nigeria, Benin, Ghana and Cote d'Ivoire. However, the interdependence of the water network especially the River Niger system facilitated the spread of the weed to other countries in the region.

Water hyacinth infestations have now covered Senegal, Guinea, Burkina Faso, Mali and Niger. In 1988, the Nigerian Federal Ministry of Science and Technology organised an international workshop in Lagos on "Water hyacinth, Menace and Resource".

By 1992, the occurrence of water hyacinth in the River Niger and the Kainji Lake was confirmed. The weed entered Nigeria via the Niger Republic at Lolo, a border village on the River Niger (Kusemiju and Chizea, 1992). The presence of water hyacinth in Kainji Lake posed a major threat to the Kainji dam which supplied hydro-electricity to Nigeria and the Niger Republic. The economic cost to Nigeria if water hyacinth in the Kainji Lake was not immediately brought under control would be incalculable in terms of hydro-electricity, fishery and communication.

Recognizing the need for an integrated approach, ECOWAS (the Economic Community of West African States) with financial support from the African Development Bank (ADB) engaged EUROCONSULT, a consultancy firm from the Netherlands to conduct a study on "Control of floating weeds in the ECOWAS member countries". The study dealt with the

investigation of degree of infestation of floating weeds in the member countries, and the preparation of projects for their control. Details of the investigations and identified projects are contained in the ECOWAS Reports (1995) and will be very relevant to the control of "Water Hyacinth in the 21<sup>st</sup> Century" especially in the ECOWAS region.

## **PROBLEMS POSED BY WATER**

### **HYACINTH**

Problems posed by Water hyacinth have been extensively reviewed by Gopal and Sharma (1981) and Jayanth (1987). They are summarized as follows:

- (a) It impedes the flow of water in irrigation systems. 40-95% reduction has been reported.
- (b) Prevents the free movement of boats and other navigation vessels.
- (c) It interferes with hydroelectric power generation. That in very clear language means that with infestation of Kainji Lake by water hyacinth, hydro-electric power from the Kainji Dam is now threatened.
- (d) It reduces the volume of available freshwater by increasing losses through evapotranspiration. Various authors recorded 1.26 to 9.48%

increase in water loss, compared to open water surface.

- (e) It impairs the quality of water. The plant cover imparts obnoxious smell, colour and suspended particulate matter to water, making it unfit for human consumption.
- (f) Dense growth of water hyacinth causes serious disruptions to other aquatic life like phytoplankton and fish. According to Gopal and Sharma (1981), in West Bengal about 45 million kg of fish were annually lost due to water hyacinth in early 1950s.
- (g) It provides suitable habitat or food or both for molluscan and insect vectors of diseases like schistosomiasis and malaria. It gives shelter to adults and also prevents mosquito larvae and adults from being preyed upon by their natural predators like insects, frogs, fishes etc.
- (h) The rate of organic production by water hyacinth is so high that it leads to silting and gradual drying up of water bodies.

#### **ECONOMIC IMPACTS OF WATER HYACINTH**

The negative economic impacts of water hyacinth infestations have long been appreciated. In the United States, the problem was so serious that the American Congress in 1897 made an appropriation to study the problems posed by the weeds.

The States of Florida, Louisiana and Texas now spend \$11 million yearly trying to control water hyacinth in infested waterways. In the Sudan, the control of water hyacinth is estimated at \$10 million annually.

The ECOWAS Report (1995) examined the socio-economic impacts of floating weeds in the ECOWAS region. In the fisheries sector, the potential losses as a result of water hyacinth infestation in the sub-region was put at \$20 million. Estimate of other experts indicated that at current infestation, the losses could even be of the order of \$68 million for the affected countries. Their calculation was based on 20% infestation and 40% fish catch reduction in infested waters.

Irrigated agriculture is of crucial importance in the ECOWAS region. Aquatic weed infestation causes marked losses in agricultural production. The order of magnitude of the losses in the region when the production of irrigated agriculture would drop by 1% was estimated at \$36.8 million.

The estimated losses in hydro-energy production in the sub-region was put at between 7 and 14 million US dollars. It noted that the losses could be substantially higher. In several countries in the sub-region, energy production is regularly interrupted for a number of days, as the inflow to the turbines had to be cleared of weeds. Water hyacinth also reduces the

volume of water in the reservoirs through evapotranspiration. A summary of losses caused by floating weeds is given in Table 1. Using a defensive expenditure approach, the World Bank report, "Towards the Development of an Environmental Action Plan for Nigeria" estimated that water hyacinth control in Nigeria would cost \$50 million annually and that the species negatively affects about five million people (Western African Department, 1990; West Central Africa Department, 1995).

### **METHODS OF WATER HYACINTH CONTROL**

In most countries with water hyacinth problems, three methods have usually been employed for its control – manual and mechanical harvesting, biological and chemical control. The system adopted however, depends on several considerations. Even within the same country, different methods must be considered based on specific locations and workability. In our case, here in Nigeria, experience on the water hyacinth problem in past fifteen years confirms the need for a mixture of strategies in tackling the problems in the wide variety of water bodies that are already infested. In doing so, the cost effectiveness and environmental impact of whatever control strategy is employed must be borne in mind.

#### **(a) Mechanical Control/Harvesting**

Harvesting is a useful method for water hyacinth control but there are serious bottlenecks. To be effective, the harvesting method has to be fast enough to outpace the reproductive potentials of water hyacinth. According to Khan and Thyagarajan (1988), under the most favourable conditions, 10 plants can multiply to 600,000 in only eight months. To be effective therefore, the harvesting rate must be equal to or more than the growth rate.

So far, mechanical harvesting has not been a continuous exercise in Nigeria. Most of it has been done to combat a surge or to open up already blocked waterways. There is bound to be a recurrence except harvesting is backed up with regular mopping.

Utilisation of harvested plants is also suggested to solve the problem of disposal and also to meet at least partially the cost of harvesting.

#### **(b) Biological Control**

It is believed that on the long-term basis, biological control will be relatively cheaper than other methods of control. By far, the most successful

**Table 1 Summary of losses caused by floating weeds in ECOWAS Region**

Sector	Low Estimated Losses (millions US\$)	High Estimated Losses (millions US\$)
Fisheries	28	56
Health	4	8
Hydro-energy	7	14
Agriculture	36	72
Total	75	150

Source: ECOWAS Report (1995)

agents are the weevils, *Neochetina eichhorniae*.

In 1992, rearing of the weevils started at the Nigerian Institute for Horticulture (NIHORT) under the auspices of the National Committee on Water Hyacinth. Releases were made in 1994 at Iwopin (Lekki Lagoon). Releases are also in progress at various sites along the River Niger by NIFFR (National Institute for Freshwater Fisheries Research) under the Nigerian/German Kainji Lake Fisheries Promotion Project. Work on biological control in Nigeria has been seriously hampered by funding.

Other biological control methods involve using herbivorous animals – grass carp, other herbivorous fish, manatees, and other herbivorous animals. For the past few years, this author has advocated the use of the grass carp (even as a pilot project). But no fund has been made available for the project.

The grass carp has been shown to be a very effective method of water hyacinth control in several countries including Indonesia, Philippines, Guyana (Soerjani, 1984; Buruah, 1984). In the process the weed is cleared and one gets sizeable fish thereby contributing to fish production and improving the economy of the riverine people who now regard Water hyacinth as a menace. According to Soerjani (1984), in Indonesia, in a Water hyacinth monoculture, fish of 6 – 8 cm with a density of 4 – 16,000/ha reduced water hyacinth population of about 1,200 ton/ha with 48 – 83% compared to the potential growth in two weeks.

#### (c) Chemical Control

Though chemical control of water hyacinth is possible, the main objections to its large-scale use in the Nigerian situation are:

- i). the rural population use the creeks, rivers and lagoons for domestic and drinking purposes in view of lack of

pipe-borne water. Indeed over 80% of people of Ilaje area depend on this as their main source of water for life. The nearly 30 fishing villages on the periphery of Lekki Lagoon (a major area of water hyacinth infestation) drink the water directly.

- ii). the lagoons and rivers are major sources of fishing and nursery grounds for early development of many species of fishes and shrimps. Such aquatic animals and sessile moluscs will be contaminated.
- iii). chemical spraying will result in serious pollution problems as the water weeds decay.
- iv) the unforeseen toxic effects of residual chemical on aquatic organisms and man.

Indeed, according to Obeid (1984), after chemical spraying of water hyacinth in the White Nile, the local people who live close to the river complained of stomach ache and intestinal troubles – effects that were traced to the chemical spraying. Harley (1989) also warned that there was an environmental cost in using herbicides. Residues of herbicides in the water and sediments may affect the aquatic environment and kill fish directly or by reduced levels of dissolved oxygen caused by decaying weeds. The pity of it all is that the chemical control treatment must be

continued indefinitely or the infestation will regenerate from scattered plants and seeds and the on-slaught on the environment will continue.

I have never been completely against the use of chemicals but it must be limited to areas where they are absolutely necessary and will do only a little havoc. Such usage must also be borne on tested experiments. The occurrence of water hyacinth in Kainji Lake raises a fresh problem for use of chemicals. The Kainji Dam so important in the hydro-electric supply of Nigeria must be protected. In case of a major surge in the dam area, a buffer zone can be created around the dam. Appropriate chemical can then be sprayed around this buffer zone to keep the water hyacinth in check and prevent it from fouling up the dam. The dead weeds can then be mopped up. Details of these must be jointly examined by NEPA and NIFFR before the exercise is initiated.

For the rest of the River Niger in Nigeria, it must be a combination of biological control, manual and mechanical harvesting, adequate monitoring and burning up of the weeds when certain parts of the River Niger dry up.

#### **Utilisation as a Method of Control**

Utilisation of water hyacinth for a wide range of purposes has been suggested as a method of checking and exploiting its growth and spread. Jayanth (1987)

listed the following uses for water hyacinth utilisation:

- (a) as manure
- (b) for producing processed feed for pig, cattle and other animals.
- (c) as a source of protein, gibberellic acid etc.
- (d) as a vegetable for human consumption.
- (e) for extraction for fibre or making paper and other products.
- (f) as a renewable source of energy in the form of biogas rich in methane.
- (g) for waste water treatment.

Realising that fresh water hyacinth contains nearly 95% water, most of which has to be extracted before usage, the economic viability of the economic uses must be seriously considered. In any case, utilisation must never be considered as an option for controlling the menace of water hyacinth.

#### **DEVELOPMENT MANAGEMENT STRATEGIES FOR WATER HYACINTH CONTROL**

Water hyacinth has become an ECOWAS problem as a result of the interdependence of the water network which facilitates the spread of the weed from one country to another. Jointly funded projects must therefore, be established to carry out biological, mechanical and chemical control in

representative areas in ECOWAS countries where Water hyacinth is causing problems. Such readily identifiable projects will be between Nigeria and Benin Republic to tackle the problem in the coastal lagoons, creeks and rivers. Projects to tackle the water hyacinth in River Niger and Kainji Lake must be established between Nigeria and Niger Republic. The bilateral initiative, previously carried out by the National Committee on Water hyacinth should immediately be revived.

It must be emphasised that the main emphasis should be on biological control of water hyacinth with interventions and use of mechanical and chemical control where absolutely necessary. The aquatic ecosystem must be preserved as much as possible in dealing with the Nigeria problem. In Nigeria, the National Committee on Water Hyacinth should be revived and made active. The National Committee should ensure the setting up of Water Hyacinth Control/Management Units at the State and Local Government levels. The Nigerian government must immediately recognise water hyacinth as a major ecological disaster.

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