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Enhancement of tilapia production through improved Aquaculture practices

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Abstract

By far, Nile tilapia is the mostly cultured fish in ponds because of the good market it commands and its wide acceptance by the people throughout the country. About 70% of the stocked fish ponds is tilapia. However, in spite of that, fish farmers in Uganda have generally complained about the poor performance of tilapia fish in ponds, besides its availability for stocking. Following these complaints the scientists at Kajjansi together with Fisheries Extension Workers embarked on putting certain measures in place. These included selection of candidate tilapia species for brood stock, elimination of contamination of parental stock and fish fry, improvement of skills of farmers in management of fish ponds, conducting on-station and on-farm trials, production of quality fry, fertilizing ponds/feeding fish using sunflower oil cake and provision of basic equipment like harvesting nets to the contact farmers. Preliminary results showed that the production levels increased from 12kg./100m²/year to an average of 20kg./100m²/year in western Uganda. Fourteen ponds in various parts of the country (North, Central and Western Uganda) were stocked with tilapia fry and 26 fish farmers from those pilot districts were trained in various skills of fish farming. These measures increased fish production through improved aquaculture practices and improved fry quality. It is hoped that this improvement would ultimately reduce fishing pressure on the fish stocks in the wild, improve the income of the households and eventually reduce the poverty level of the fish farming communities. There is need to extend similar efforts to other parts of the country.

Introduction

The recent baseline survey conducted by NARO/ MAAIF Fish Farming Project in the year 2000 on aquaculture development in the country revealed that about 70% of the stocked fish in ponds in Uganda is tilapia. When fish farming was introduced in early 1950s, carp was the next favorite culture fish and for a long time these were the two known species for pond culture.

Fish farming in Uganda is largely subsistence, contributing about 1.8% to the household income (NARO/MAAIF Fish Farming Project, 2001). The remaining largest amount is contributed mainly by crops and livestock.

Fish farming is still regarded as a part time activity by most of the farmers in the country. This is reflected in the amount of time and effort the farmers put in caring for the fish in ponds. Most farmers hardly feed the fish, besides failing to apply organic manure which is the primary source of food for most tilapia species. Others simply throw into water plant leaves as food for fish regardless of whether or not the fish utilize it. Some of the farmers do not sample their ponds to find out how the stocked fish are doing and if necessary take appropriate steps to ameliorate the situation. Yet,it is important to regularly monitor the fish in ponds to check if they are in good condition in terms of growth and health.

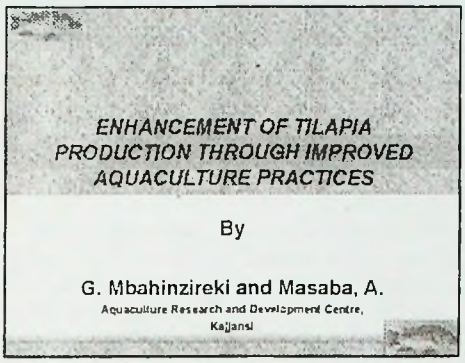
The problem

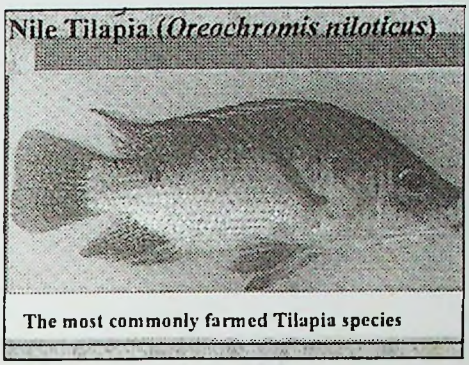
Farming of tilapia in Uganda has always been associated with a few problems which create negative impacts on the practice. The problems range from quality of seed, feeding to the growth rates of tilapia (Mbahinzireki,1999). The quality of seed can be

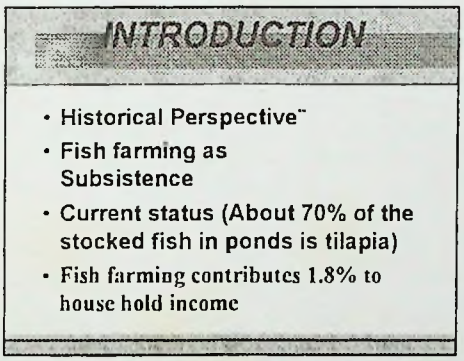
rendered poor by either using wrong tilapia species as parental stock which do not perform well in ponds or taking seed which has been contaminated by other undesirable tilapia species or lack of screening the water inlets. This usually comes about as a result of failure to identify the correct tilapia species. It is usually difficult to distinguish different tilapia species at juvenile stage. The tilapia species recommended for culture is Nile tilapia (Oreochromis niloticus) (Fig.1) and occasionally Tilapia zillii. Nile tilapia has several attributes that make it a suitable candidate for pond culture and these have been outlined elsewhere (Mbahinzireki, 1999).

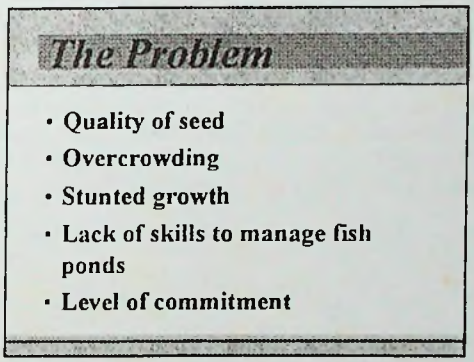
There are certain management measures that can be taken to overcome the above mentioned problems. However, these problems need to be handled together with the farmers and solve them practically. A study was therefore undertaken to demonstrate to a few selected fish farmers how best a pond stocked with tilapia can be managed using quality fish seed, proper stocking rates and locally available food resources.

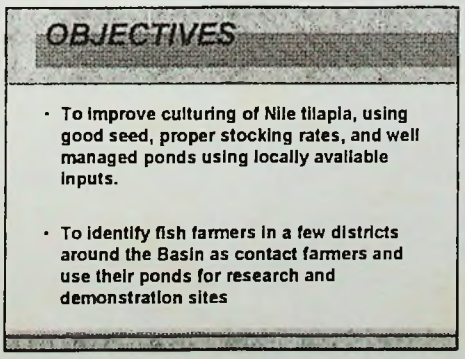
Fig 1.

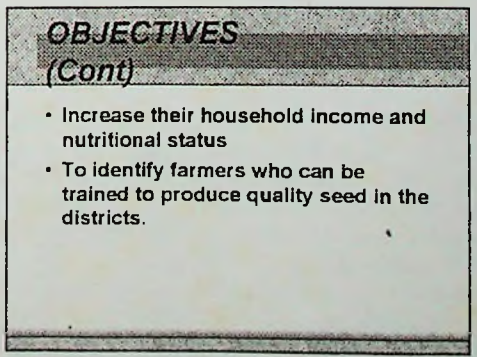












Materials and methods

Brood stock of Nile tilapia (both males and females) was collected from Lake Victoria and stocked in ponds which had been properly prepared for breeding, inlets and outlets screened against foreign fish, limed and fertilized with organic manure (chicken droppings, brewery waste, domestic left-overs, etc.). The brood stock was fed once daily on a ration of a mixture of maize bran, rice bran, cotton seed cake, fish meal and premixes of vitamins and minerals. After two months of conditioning the parental stock, fish fry were produced within the ponds.

The fish fry were harvested with a fry net and transferred into a hapa (5x3x1m), a net enclosure (Fig.2) where they were nursed and kept away from any possible contamination and predation by other fish species and animals.

Fig 2.

ACTIVITIES

- Stocking and maintenance of brood stock of N. tilapia from the wild.
- Production of uncontaminated Nile tilapia seed in ponds and nursing in hapa.
- Identification of contact farmers in the districts in conjunction with DFO.

Harvesting fry from a hapa (Net enclosure)



Picture taken at Kajjansi Research centre

ACTIVITIES (Cont)

- Preparation of the farmers' ponds (drainable, free of fish, liming, etc.).
- Training of farmers and service providers (extension agents)
- Stocking of farmers' ponds with N. tilapia (3/m²)and *Clarias gariepinus* (30%)

ACTIVITIES (Cont)

- Application of organic manure, consisting mainly of cow manure, chicken manure, brewery waste and domestic left-overs.
- Monitoring the performance of the stocked seed once a month (sampling, measuring), farmers supervised and guided by FEW/staff.

Materials Supplied to farmers

lime,
pipes for water inlet and outlet,
harvesting nets,
weighing balances,
record books,
etc.

RESULTS

- Preliminary results indicate that the average fish pond production is estimated at 20 Kg. /100m² /year in western Uganda (Compared to earlier figure of 12 Kg. /100M² /year).
- 42 fish farmers trained in aquaculture skills

With the help of the District Fisheries Officers and Fisheries Extension Staff, five farmers were identified from each district as contact farmers. This exercise was carried out in the districts of Ntungamo, Lira, Mbarara and Rakai. The contact farmers and the Extension staff were then trained in general fish pond management skills before stocking farmers' ponds with fish fry. One pond of each farmer was selected, drained, dredged, where necessary, limed and filled with water ready for stocking. The pond size varied between 200 and 1000m^2 in area with an average size of 370m^2.

Each pond was stocked with Nile tilapia fry at a stocking density of 3 fry/m^2, each fry weighed an average weight of 1.0g. The same ponds were stocked with fingerlings of *Clarias gariepinus* at 30% of the stocked tilapia fry. Each *Clarias* fingerling measured an average weight of 2.0g. The catfish was stocked to control the population of young tilapia when the stocked fry mature and eventually start reproducing.

Each contact farmer was provided with p.v.c. pipes for fixing inlet and outlet of the pond to control invasion of the stocked fish with other foreign fish species by screening both pipes with fine net mesh. Other materials supplied to the district fisheries staff included harvesting nets, spring balances, rules and record books for regular sampling and general data collection.

Results

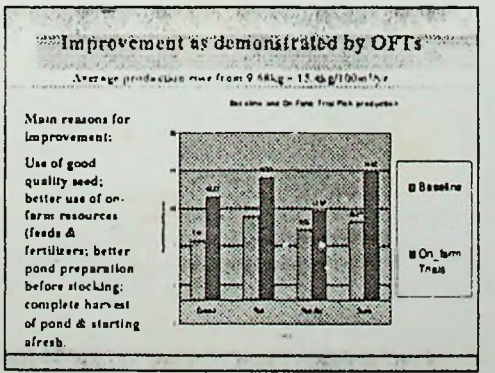
The preliminary results show that an estimated average weight of 17kg./100m^2/year of Nile tilapia and 29kg./100m^2/year for *Clarias gariepinus* were produced in the districts of Ntungamo, Lira and Mbarara (Fig.3). Production figures for Rakai were not yet available for inclusion. Figure 4 shows the performance of on-farm trials of Nile tilapia fed on sunflower oil cake in Lira.

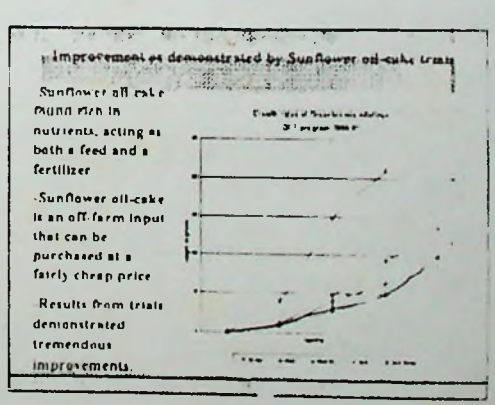
The research team was able to organize training for 26 fish farmers and 6 service providers from four districts during the course of the field trials. The training program covered pond preparation and maintenance, fish fry and brood stock handling, fry production and nursing, feeding and harvesting of fish.

Discussion

The results obtained on production levels in the districts where the trials were carried out, suggest that once the seed quality is good enough, the next most important factor is management of the fish ponds themselves. The management of ponds entails regular application of manure, maintenance of the water quality, feeding using locally available resources, control of tilapia population and periodical harvesting of the fish. Earlier production levels recorded for tilapia in the same region by NARO/MAAIF Fish Farming Project (2001) were 12kg./100m^2/year with very little input into the system. Good seed quality combined with good pond management gave an average production level of 20kg./100m^2/year, an increase of 40%. This implies that if farmers spared more effort and resources to improve on the feeding of fish, better production could be achieved. Protein-rich feeds like addition of fish meal would result into higher fish yield through faster increase in body weight (Rumsey, 1993). Unfortunately, fish meal would increase production costs and it is one single costly ingredient of fish feeds (Rodriguez-serna et al..1996). Clearly, lack of appropriate formulated feeds for fish has been partly responsible for the poor yield of fish from ponds. It was however observed by scientists carrying out field trials in the district of Lira that pond production was improved when sunflower oil cake was used as food for Nile tilapia as well as a fertilizer (NARO/MAAIF Fish Farming

Fig 3.



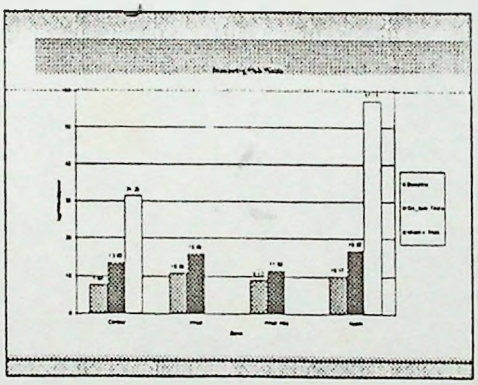


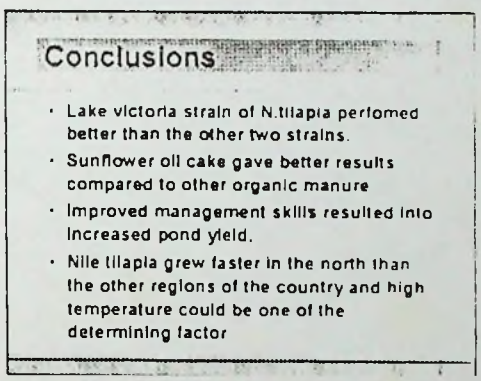
Project, 2001). The results demonstrated tremendous improvement in growth rates of Nile tilapia (Fig. 4). Production levels in Lira increased from 2.1 t./ha./yr. to 5.1-6.7 t./ha./yr. when sunflower oil cake was used to feed Nile tilapia. Sunflower is one of the crops which does well in the north and other parts of the country and can be used as one of the cheapest locally available raw material as an input (Jackson et al., 1982). However, it is still unclear what factor in the oil cake that makes fish respond positively! It is possible that the cake is rich in protein or could contain some other growth promoting factors, hence the need to investigate what exactly is the driving factor. Meanwhile, there is an urgent need to formulate appropriate feeds for different varieties of cultured fish species in order to make fish farming a viable venture. Development of commercial feeds will particularly be crucial in the development of commercial fish farming in the country.

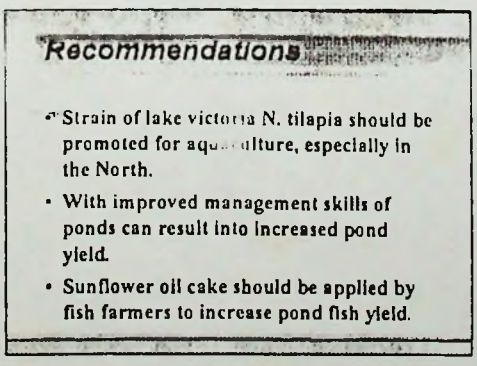
Temperature is another factor which appears to be a big driving force in increasing fish production in certain parts of the country. Field trials conducted in the north of the country where ambient temperatures go as high as 30°C found that Nile tilapia production in the north was about 2.1 t./ha./yr. compared to 1.5 t./ha./yr. in western and Central Uganda where temperatures rarely go above 25°C (NARO/MAAIF Fish Farming Project, 2001). Therefore, temperature is an important factor which cannot be ignored and has to be taken into consideration when planning to develop aquaculture in the country.

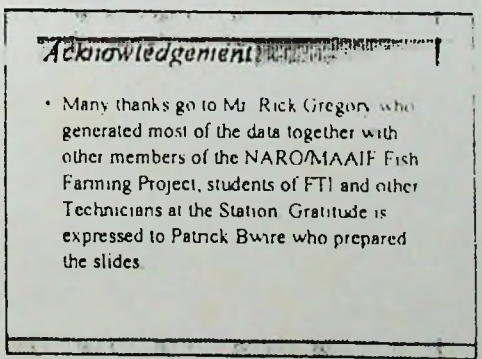
Fish farming in a rural setting is one of the activities which communities carry out among others and generally fits neatly in the existing farming systems. However, very little share of time and resources is allotted to fish farming compared to crops and livestock, (about 18% of the daily activities), thus relegating fish

Fig 4.









farming as a minor activity. A clear message will have to be sent out to the farmers that if fish farming is to be successful, the activity deserves an equal share of attention time and resources. This is an area where the National Agricultural Advisory Services (NAADS) will have a great role to play and disseminate the necessary information and guidance. It is only until then that good management of fish ponds coupled with good quality seed stock, can aquaculture contribute substantially to the household income and ultimately to the national income. The battle against poverty will then have been partly worn.

Conclusions

- The performance of Lake Victoria strain of Nile tilapia is superior to the others and should be promoted for aquaculture,
- Improved management skills among farmers and extension staff resulted into increased pond yield,
- Sunflower oil cake gave better results compared to other organic manure in terms of growth rates of Nile tilapia,
- Nile tilapia grew faster in the north than the other regions of the country and this was attributed to high temperatures of the area.

Acknowledgement

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