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# FISHCULTURE EXTENSION PROJECT - BRAZIL

July 1, 1973 - December 31, 1973

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Introductio

Since the author's second semi-annual report (December 1, 1972 - June 20, 1973), progress in developing a self-sufficient extension service within the DNOCS Directorate of Fisheries and Fishculture has continued at a very satisfactory pace. Intensive fishculture was begun on one large farm during the last semester and numerous similar iniciatives are expected in 1974.

Increased DNOCS dissemination of scientific information and non-technical information through the local and regional news media reached local farmers and created a genuine interest in raising fish as a farm crop. The author and his counterpart have thus been flooded by requests during the last semester to evaluate farmers' lands as to their suitability for intensively raising fish. Because of the promising results from experiments carried out using the hybrid tilápia, and as a result of the tilápia culture's proven economic feasibility (see annex), the fishculture extension service has been able to determine with confidence each individual farmer's possibility

for success in a fishculture enterprise. Also, these requests by farmers for technical assistance are building confidence and providing excellent extension experience for the DNOCS fishculture extensionist, while at the same time demonstrating to DNOCS the importance of a well managed fishculture extension service.

## Intensive Fishculture Extension

### Private Farms

During the last semester, extension efforts have been aimed mainly at implanting intensive fishculture projects on private farms. Since the termination of the first tilápia hybrid experiment in June, 1973, the DNOCS fisheries directorate has promoted the raising of this fish with determination and confidence. Experimental results and a subsequent economic analysis showed that the intensive culture of the tilápia-hybrid is technically, as well as economically feasible. To reach farmers, the use of television, radio and newspaper media has been well employed by the DNOCS, creating widespread interest in intensive fishculture.

Many farmers, therefore, have come to DNOCS requesting assistance. After the extensionist visits the farmer's property, the farmer is told whether or not intensive fishculture would be a viable crop for him. Of the approximately 25 locales visited in recent months, eight of these have the proper conditions and are either in production or in the

planning and construction stages. The "Fazenda Jaramataia" was the first farm to actually begin raising fish intensively, receiving assistance from the DNOCS fishculture extension service. This farm is located in the county of Maranguape, approximately 70 kilometers west of Fortaleza. The Maranguape area offers excellent opportunities for intensive fishculture because of its suitable soils for pond construction, relatively abundant water supply, proximity to Fortaleza and, in general, more progressive farmers.

The Fazenda Jaramataia, owned by Francisco Caetano Prata Braga, is nearly 1,000 hectares in area containing two reservoirs, one large (4,000,000 $m^3$) and the other small (100,000 $m^3$). Dairy will constitute the major production of the farm beginning in 1974 as cattle are bought through SUDENE (Superintendency for the Development of the Northeast) financing that has been obtained for the farm's agricultural development. Lowland areas not being used for dairy production have been set aside for building fish ponds. So that investments made by Mr. Braga in pond construction were not prohibitively high in the beginning, it was suggested that he construct semi-natural ponds by damming small natural watersheds. In four months, three ponds (2 hectares of water) have been constructed at a cost of less than Cr$ 2,000 (US$ 323.62)* per pond including drainage and water distribution systems compared to the approximately Cr$ 8,000 (US$ 1,294.50) needed to build excavated, rectangular

*Exchange 6,18 Cruzeiros to the US dollar.

ponds by tractor. To facilitate capture of fish a canal-like collection basin was made extending ten meters from the base of the dam in a perpendicular direction. Also all other low areas were filled in so that the harvest of fish can be executed by seining only in the harvest basin.

One more pond of one hectare and three small fingerling production ponds are planned for the Fazenda Jaramataia making a total area of over 3 hectares to begin fish production.

The first pond to be constructed, (6,000 $m^2$) at the base of the large reservoir, is already producing fish and the first harvest is scheduled for late January, 1974. A low stocking rate (2,750 fish/ha.) was used because of a shortage of available fingerlings from the DNOCS at the time of stocking. Of the 1,650 fish stocked, there are 1,050 Tilápia nilotica males, 300 tilápia hybrids (100% male), and 300 israeli carp. As indicated by recent samples, total harvest weight in four months should reach nearly 600 kgs. or 1,000 kgs/hectare. The average weight of fish at stocking was 53 grams.

Production costs are extremely low as growth is being obtained by using only a combination of inorganic and organic fertilizer. To enrich the pond before stocking 100 kilograms of triple superfosfate were applied in two weekly applications and following this 500 kilograms (830 kgs/ha) of chicken manure were applied bi-weekly; the chicken manure being acquired free from local chicken ranchers. Other minimal costs include labor and transportation.

Mr. Braga plans to sell his fish in Fortaleza on open markets in the beginning, and later, with larger productions, at fixed locations throughout Fortaleza and in Maranguape. Because the tilápia hybrid has a tremendous resistance to handling, Mr. Braga is planning to retail his fish live in the future. The retail price for fresh tilápia on the Fortaleza market is presently Cr$ 6,00/kg. Fish sold by the Fazenda Jaramataia in January will be worth approximately Cr$ 3,600 or probably enough to cover production and construction costs in four months!

On January 10, Tilápia nilotica are being flown to the state of Maranhão where they will be used to begin intensive fishculture in a community that has difficulty in obtaining protein of animal origin. Three ponds of 1,000 $m^2$ each will be used to iniciate this community fishculture project.

Other intensive fishculture projects in the planning stages for private farms range from small, local consumption to large scale commercialization enterprises. Presently most projects are confined to the state of Ceará, although projects in Maranhão and Rio Grande do Norte are about to commence. Outlying projects such as these will be encouraged in the future only if the site offers near perfect conditions or extension help is increased so as to be able to give the required technical assistance.

The author, during the next semester, will be encouraging DNOCS to concentrate extension efforts in the Maranguape area.

Here, because of already-mentioned advantages of soil, water, and market proximity, intensive fisheulture has the best chances of being successfully implanted. Successes in this region will certainly give rise to expansion into other suitable outlying regions.

DNOCS Irrigation Projects

In each of the two previous semi-annual reports, the author has discussed plans for implanting intensive fisheulture among colonists in the DNOCS Irrigation projects.

For various reasons including a lack of a proper fish species, an economic analysis, support money for implantation and, even, political support from the DNOCS Directorate of Irrigation, intensive fisheulture has never succeeded in becoming part of the infra-structure of the Morada Nova and Lima Campos irrigation projects.

Now, armed with a suitable fish (tilápia hybrid), an economic analysis of its culture, and the awaited support money from the SUDENE/SUBIN funds, the DNOCS Directorate of Fisheries is confident of being authorized to begin implanting intensive fisheulture in either Morada Nova or Lima Campos. In fact, the DNOCS's general director has suggested that the Fisheries Directorate design a project for a similar colonization project based on intensive fisheulture. A DNOCS reservoir would be chosen with a hydraulic basin below the dam that does not offer proper conditions for economically raising agricultural

crops, but does offer conditions proper for fishculture. In the same manner that DNOCS screens, choses, and settles colonists on agricultural irrigation projects, an intensive fishculture project would be implanted. Further preliminary studies will be made this year to analyze this very intrigueing possibility.

Manual

The simple, comprehensive, intensive fishculture manual, discussed in the last semi-annual report, is ready for publication, lacking only a page giving a simple economic analysis of the tilápia culture. As no financial or other problems are apparent, publication should take place in February, 1974.

Economics

Until December, 1973, one of the major problems facing extension was the lack of a thorough economic analysis that could be used to prove to farmers the economic feasibility of the tilápia hybrid culture. To solve this problem a short-term consultant, John E. Greenfield, regional economist of the National Marine Fisheries Service, was brought in to work with the DNOCS fisheries economist in formulating an economic analysis (annex) of the tilápia hybrid culture. The contribution made by this man in helping analyze the economics of tilápia hybrid production was invaluable - not only as a service to the extension service, but also to the DNOCS fisheries

economist, who greatly benefited from Dr. Greenfield's knowledge of fisheries economics.

It is interesting to note that at the beginning of the tilápia hybrid experiments some doubts as to this fish's profitable culture were held because of the moderately low prices received for tilápia on the wholesale and retail markets. Within the last six months these doubts have been erased, not only because of the economic analysis proving its feasibility at lower prices of six months ago, but also because prices, as well as demand, have increased for fish throughout the entire region due to doubling meat (beef) prices and/or its disappearance from consumer markets. This condition has inflated the price of fish (although not to the extent of red meat) and increased consumption greatly, especially in the interior markets where the consumer's buying power is extremely low. General belief is that beef prices will not be lowered, forcibly and permanently placing fish into a more preferred category of meat.

Loans

In the previous semi-annual report, the possibility of securing loans from the Banco do Nordeste Brasileiro for building demonstration ponds on private farms was discussed. Due to the great demand for technical assistance from private farmers in the last few months, the author must admit that there was not sufficient time to furthur study this possibility.

However, contacts were maintained and the possibility for such financing is likely to exist indefinitely.

The possibility for private farmers to secure loans for intensive fishculture was investigated thoroughly in the last semester. It was found that either the Banco do Brasil or the Banco do Nordeste Brasileiro can loan to private farmers through the PROTERRA program sponsored by the Brazilian Government. Loans for fishculture repayable in five years at 7% annual interest are obtainable.

Problems

Presently there exist three problems that were encountered while working to implant intensive fishculture in Northeast Brazil. The first is the need for additional fisheries extensionists. It does not appear that an agreement with ANCAR, the agricultural extension service, will be reached in the near future, so other sources must be investigated. Since all federal government hiring is frozen, the DNOCS will have to look for technicians that can be acquired through agreements with other federal or state agencies. In December, 1973, one such technician started work as a limnologist with the DNOCS Directorate of Fisheries through agreement with the State Secretary of Agriculture. It is the hope of the author that the DNOCS will make further, similar agreements to satisfy the needs of the extension service of at least one more extensionist in the near future.

The second problem concerns the supply of tilápia hybrid fingerlings needed to satisfy demand by farmers. As an incentive the DNOCS provides fingerlings to farmers at no cost. After the first stocking plans are to charge a small fee per fingerling. The problem is that the DNOCS has not, nor will it be able to supply fingerlings to all farmers requesting them. To alleviate the present shortage, some experimental ponds at the intensive fisheulture experiment station have been put into fingerling production. Also, all four DNOCS fish hatcheries throughout Northeast Brazil have received broodstock for producing the tilápia hybrid and work is proceeding to teach each station's biologists the techniques of tilápia hybrid fingerling production.

Even with such measures being taken the author realizes that the DNOCS will not be able to continue satisfying the demand. To capable large farmers, with perhaps over one hectare of water in production, tilápia broodstock will have to be given by the DNOCS so that the farmer may produce his own fingerling supply. On farms with small areas in hybrid production the DNOCS hatcheries must continue to supply fingerlings. The author envisions the ideal situation that will most likely solve the fingerling problem of the future; that is, of certain farmers raising fingerlings to sell to producers, similar to the situation found in the catfish producing industry of the United States.

The third problem is a condition that the author and his

counterpart are encountering on numerous farms; the problem of sand, unsuitable for proper pond construction. Rainfall occurs more frequently along the coast of the Northeast providing better water sources for fisheulture than are generally found in the interior regions. In fact, more farmers from this region, recognizing this valuable water resource, have requested technical assistance for raising fish than farmers of dryer regions. But, since soils are generally not suitable in these wetter areas, the extension service can only discourage these farmers who have interest in raising fish. To perhaps better utilize at least some of these sites for fisheulture, the author hopes that within a year the DNOCS intensive fisheulture researchers will perhaps consider doing research in pond construction in sandy soils investigating plastic pond linings, clays and other suitable water-retaining materials.

Semi-Intensive Fisheulture

Roadside borrow-pits that the author and his counterpart stocked with tilápia at the end of the last rainy season are now beginning to benefit rural populations living nearby. The author has noted fishing activity in all bodies of water that were stocked. As the ponds dry, local people catch all fish from the ponds. The fish are either eaten soon after being caught or are salted and dried for later consumption. This "windfall"of fish comes just at the time of the year

when poor rural populations are in need of cheap protein; that is, after the long (8-9 month), dry season when income and crop production drops to near zero.

The author feels that this type of stocking program is invaluable for reaching the protein-hungry people and hopes that the DNOCS will consider its continuation at the end of the next rainy season when, if rains fall normally, the region becomes dotted again with thousands of these small bodies of water.

The creel censuses to measure production of small, permanent and temporary bodies of water continued normally through the last semester. In July the author's counterpart organized a creel census to record fish production data for a 7 hectare temporary lake in Croatã, Ceará. Presently the two censuses in Umirim and Croatã, Ceará are functioning normally. The study is programmed to end in July, 1974.

Counterpart

The fisheulture extensionist that began working with the author in April, 1973, has formed an excellent base for an enlarged fisheulture extension service to build upon. Antônio Carneiro Sobrinho is a very well qualified fisheulturist as well as a person that is able to communicate with rural farmers; explain, in their terms, the techniques of fisheulture.

With the increased extension work load, the author, during the next semester, will investigate all possibilities of the

DNOCS employing more technicians to be placed in fisheulture extension positions. It is likely that technicians trained in fisheulture and/or extension will be difficult to acquire. Therefore, if the personnel are acquired, the author, as the fisheulture extension advisor, must organize an intensive training program to qualify extensionists to be employed in this work.

Other Activities

1. Conferred and traveled with French fisheulturist, Jacques Bard, known for his work with tilápia in Africa. This contact was made during the period from October 1-12, 1973, while he was under contract by the DNOCS as a consultant.
2. Attended the annual DNOCS fisheries conference held in Pentecoste from October 8-12, 1973.
3. Worked as English to Portuguese translator for three short-term Auburn consultants giving seminars for the benefit of both the DNOCS biologists and the fisheries classes of the University of Ceará.
4. In the company of Mr. Shepherd Hollander, USAID/Washington, the author had an audience with the Governor of Ceará, César Cals, and lunch the following day at which the USAID/Auburn-DNOCS fisheries project was discussed at length with the Governor and other State Authorities.

5. The author spent three days from December 10-12, 1973, with Mr. Shepherd Hollander from the office of Public Affairs, USAID/Washington, traveling and gathering information for an article describing this project for possible publication in Front Lines magazine.

Priorities for Period January 1, 1974 - June 30, 1974

1. Investigate possibility of the DNOCS placing at least one more technician in a fisheulture extension position.

2. Publish fisheulture manual.

3. Continue work with private farmers together with counterpart extensionist.

4. Continue creel censuses in Umirim and Croatã, Ceará.

5. Begin studying possibilities of implanting an intensive fisheulture colonization project to be organized by the DNOCS.