

The Role of the Agriculturist in the Development of Fish Production

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CEYLON with a population of about 8,000,000 had to import fish to the value of Rs. 68 million in 1955. This represents the value of about 85 million lb. of fish. The total local production of fish may be roughly assessed at 90 million lb. This is harvested by about 60,000 fishermen giving an average production of 1,500 lb. per head per year. For comparison with this productivity, we have fairly well developed countries such as Denmark where the average production is about 33,000 lb. per head per year, and the highly specialized purse seine fishery of the West Coast of Canada which yields a production of over 150,000 lb. per head per year.

The bulk of Ceylon's fish production now comes from the sea. Nevertheless, there are about 140,000 acres of inland fresh waters and about 300,000 acres of brackish and salt water lagoons which are today producing comparatively little fish. Similar natural waters in Indonesia, where the climate and conditions are very much like those found in this country, give an yield of about 700 lb. of fish per acre per annum. If the fresh waters in Ceylon were to be stocked with suitable food fishes and harvested regularly, there is no reason why they should not yield an average of 500 lb. per acre per annum. This would give Ceylon an additional 70 million lb. of fish per year. This estimate does not take

into account the possible production from brackish and salt water lagoons.

The Gouramy. A good index of the prospects of increasing the production of fish from our fresh waters can be found in the accidental introduction of the Gouramy into Ceylon waters. This fresh water fish is extensively cultivated and highly esteemed as a food fish by the peasants of Java, from where a few specimens were introduced by the late Mr. G. M. Fowler, a keen fisherman, about the year 1900, but none of these fishes survived. In 1909, a further supply was brought from Java to Colombo by the late Mr. Kelway Bamber. These were distributed among the dams at Mahavilla estate in Ulapane, Drayton in Kotagala, the Galle reservoir at Hiyare, and an ornamental pond below the Thwaites Memorial building in the Royal Botanical Gardens, Peradeniya. In subsequent years there were a number of floods at Peradeniya, when the level of the flood waters in the Mahaveli river rose so high that this pond was submerged. In 1935, on receipt of reports of a new fish which was appearing in increasing numbers in the catches of the fishermen operating in the "villus" or flood lakes at Mannampitiya, about 100 miles lower down the river, a few specimens were obtained. They were found to be Gouramy. The Gouramy has now extended its range, and is found

to be very numerous in the catches in the lower reaches of the Mahaveli. A fisherman at Allai near the Kilivetti Ferry told the author in 1952 that, whereas in past years Gouramy used to represent about 5 per cent. of the catches, the proportion has gradually increased and they are now getting as much as 90 per cent. Gouramy. The rest of the catch consists largely of the murrel or snake head, locally known as 'lula'. The secret of its rapid establishment in our waters lies in the fact that the Gouramy is a vegetation feeder; in other words, the greater part of its normal diet consists of vegetable matter. In this respect, the Gouramy encounters very little competition from other fishes because our natural waters show a preponderance of predatory fishes, and many tons of aquatic plant life go to waste every year in our inland waters. The Gouramy is now converting these virtually useless plants into valuable animal protein food for man.

Since that time, supplies of Gouramy have been distributed by the Fisheries Department into an increasing number of the larger perennial tanks, into estate dams, private ponds, and the principal rivers in the Island; great quantities are now harvested from Parakrama Samudra, Giritale, Minneriya, Amparai, Nachchaduwa and Nuwara Wewa. Using this experience as a guide, steps were taken to introduce other food fishes of good table quality, particularly of the vegetation feeding types.

The Tilapia. When the author was in Malaya in 1948, he came across a vegetation feeding fish called *Tilapia mossambica*, which was very well spoken of as a food fish in Malaya, and which had proved to be a valuable means of

ridging inland waters of the larvae of malaria-bearing mosquitoes. Experiments conducted by the health authorities at Taiping had proved beyond doubt that *Tilapia* had completely eradicated mosquito larvae from the Taiping lakes within a few months of their introduction. Similar results have been recorded in Bengal. It was found that the fish would breed freely from about 3 months of age and that it would grow into a reasonable sized fish within a year. This fish had solved the fish farmer's problem of fry supply in the Indonesian fish farms during the war, when the normal supplies from China were cut off. After discussion with the F. A. O. authorities, and careful observation of the feeding habits of the fish, 750 specimens of *Tilapia mossambica* were imported by air on July 17, 1951, since when this fish has established itself firmly in our waters. The fish is a "mouth breeder" and the female carries its young in its mouth until they are able to fend for themselves. Examination of the stomach contents of a number of specimens has revealed that the fish will feed exclusively on vegetation where this is abundant.

When the "lewayas" (brackish water lakes) of Hambantota dried up completely in 1952, they were subsequently stocked with *Tilapia* after the rains, and this action has given rise to a fishery which has been of considerable importance to the residents of Hambantota since 1954. Production of *Tilapia* from the Karagan-lewaya which was about 5,000 lb. in January 1954 was 155,000 lb. in July, and 168,000 lb. in August 1954. Fish traders have been attracted, and there is a daily transport of fish by cycle and lorry to districts as

far away as Haputale. Alas! Karagan lewaya dried up completely in the drought of 1956. Tilapia is appearing in increasing quantities in the markets in many other rural areas into which it has been introduced, and it is captured both from inland waters and in lagoons right round the coast. It is highly esteemed as a food fish and has a ready sale. The largest specimens so far recorded were about 15 in. in length and weighed over 2 lb. Lake Tempe, in Celebes, might be cited as an example of what can be achieved. In 1935 the fish production was virtually nil, and a variety of food fishes was introduced into the lake. In 1948, 13 years later, the production was 25 million pounds of fish. But these foregoing remarks refer to results which might be obtained without any effort at intensive cultivation. With a little effort, an even more abundant production should be possible.

De-silting "Tanks". Nearly all the inland waters in the Island consist of irrigation reservoirs or "tanks". Some of these contain water throughout the year. A great many of them dry up during the drought. All these tanks contain water which is greenish in appearance. This greenish colour is due to a large quantity of living matter, both plant and animal, which is held in suspension in the water. This is known as plankton. There are virtually no fish of appreciable table quality, in these waters, which feed on plankton. Therefore a great deal of food matter which might be converted into fish flesh in our inland waters is now going to waste every year. These same waters also contain an abundant growth of the larger water plants. Each year, when these waters dry up, this vegetation decays on the surface, adding to the layer of silt at the bottom of the tank,

and from year to year these tanks are gradually silting up. The progressive effect of this silting can be seen in the great majority of the smaller village tanks. Their capacity to hold water is being gradually diminished. They fill up to spill level within the first few days of the normal North-East Monsoon rains, and overflow for a greater portion of the rainy season. Within the first three months of the dry weather setting in, these tanks run dry. Now this same deposit which silts up the tank bed contains valuable organic matter which could be used with benefit for manuring arable land. This organic matter eventually dies and decays, and it derives the oxygen necessary for its decomposition from the water, releasing acids into the water, both conditions being detrimental to the growth of fish. The removal of this silt from the tank bed for the purpose of manuring the fields will not only deepen and desilt the tank, thereby increasing its capacity to hold water, but also provide better conditions for the growth of fish in the tank when it fills up again. If the peasant can be made to see that this caked, peaty substance, which he can dig up from the tank bed when it is drying up, will improve his crops and his paddy fields, and if he can be encouraged to remove, progressively, this silt from the tank and apply it to his fields, he will gradually increase the capacity of his tank and may perhaps live to see the day when the tank does not go dry even in the severest drought. What a change such a condition can bring about in the drought ridden zone.

This is where the agriculturist can derive great benefit from the adoption of a water conservation and water utilization programme on his land. Soil erosion

can be effectively checked by the construction of dams across gullies and ravines. This will not only check erosion, but hold up valuable water for the watering of stock and the rearing of fish. An acre of water, carefully stocked and managed can give 5,000 lb. of fish each year. In Indonesia they have an average of 1,000 lb., and in the Belgian Congo 2,000 lb. per acre per year, with maximum of 8,000 and 9,000 lb. per acre per year. The waste products of the land serve as food for the fish or fertilizer for the water, and the waste produce of the pond, that is, the silt dredged up from the bottom of the pond, serves as manure on the land. By this means, waste is eliminated, and the farmer produces his requirements of protein from the water. It will make a very interesting study if a comparison were to be made of the production from farm land with the production from a fish pond, in terms of the annual yield of protein food per acre from each.

Fish Culture in Paddy Fields. Much has been said recently about the prospects of rearing fish in paddy fields. This is best done in areas where water is abundantly available. This practice is widely prevalent in the wetter areas of Malaya and the East Indies. In Indonesia with a rice crop in which water can be impounded for from 40 to 60 days, yields of from 30 to 50 lb. of fish per acre have been recorded. In Japanese rice fields the yield is about 150 lb. per acre, but, when food is added, yields of 2,000 lb. per acre have been obtained. In Malaya, the yield is about 125 lb. per acre. In Tanganyika, yields of 1,000 lb. of rice and 100 lb. of fish per acre are obtained. The Russians have reported a 7 per cent. increase in the rice crop when fish are grown under it. In China, a 10 per cent.

increase in the rice crop has been reported.

Little modification of the fields is required for fish raising. The bunds of the paddy field are raised and strengthened with the earth obtained in constructing a trench about a yard wide, a couple of feet deep, and about 30 feet long along the lower side of each paddy flat, so that if the water level in the field were to go down when the farmer is away, the fish will still have the trench into which they can retreat, until the farmer comes back and restores the water level in his fields. A sump pond of about 10 ft. by 10 ft. or less is made in the lowest field in the block. As soon as a depth of four to six inches of water can be maintained under the paddy plants, that is about 2 weeks after transplanting, small-sized fish are introduced at the rate of about 1,000 per acre. The water inlets and outlets in each block of fields are screened to prevent the escape of the fish. The fish feed among the paddy plants, eating off the algae which compete with the paddy plant for the nutriment in the soil and eating the larvae of insect pests such as the paddy stem borer, and their droppings provide a readily soluble organic fertiliser which benefits the crop. When the field is dried for the harvest, the fish are gathered into the sump pond by progressive draining of the flats and are captured from there.

The advantages in the introduction of plankton feeding food fishes into inland waters are obvious. They will convert naturally available organic matter, which is now going waste, into fish flesh which will supply the deficiency of protein in peasant diets. They will make this protein available in the less frequented and more backward districts where the channels of trade seldom

penetrate and where protein food is almost unavailable. What the farmer cannot use immediately in the fresh form he can salt and dry in the sun and keep for his own use during the rest of the year. With the increased production of fish from inland waters there will be a greater self-sufficiency in fish, and the large sums of money which are now being spent on the import of fish will be progressively reduced.

The practice of rearing fish in paddy fields does not require any elaborate or expensive preparation. It is carried out successfully by peasants in other parts of South-East Asia who are no more erudite than the peasants in this country, and the fact that this practice has been carried on for so many years in these areas can have only one explanation, namely, that the farmer is able to get a higher income from his labours when he grows fish under his paddy crops than when he does not. The hope of gain sweetens the labour involved.

Summary. It is necessary that every landowner should realize the vast potentialities which exist for improving the yield of his land through a policy of proper water conservation and water utilization. The water holding capacity of the land must be developed by a system which will at once protect his land from eroding run-off, and provide water for irrigation and livestock needs. Every body of water, whether behind a dam or only a few inches deep in a paddy field, can and should be utilized to produce protein food through judicious

stocking with fish of table quality. The best farmers in other countries with climate similar to that of Ceylon have realized and made full use of the complementary nature of land farming and water utilization, and there is no reason why their example should not be followed profitably in this country.

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