

THE POTENTIAL OF THE FRESHWATER FISHCULTURE RESOURCES
OF THE PHILIPPINES

by

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Abstract

This paper is a general review of the freshwater fishculture resources of The Philippines with their possible production potential when fully developed.

The assets considered necessary for development are (i) water resources, (ii) cultivable species and (iii) manpower.

Although about 170 species of fish are reported from the freshwater areas of the country, this report is limited to those fishes raised in impounded waters and other species which have been successfully bred in hatcheries and found to be reasonably practicable for transplanting to inland freshwater units. Their propagation can be accelerated to a relatively high degree if the Government will undertake an intensive programme of fishery management.

Training programmes, with local and foreign participants, in the improvement of modern techniques of fish culture have been carried out during the last five years to develop the man-power resources in freshwater fisheries.

The major activities being undertaken by the Government to ensure the best use of resources to maximize production are technical assistance, extension services, fish seed production, fingerling dispersal and financial aid by banking institutions.

CONTENTS

	<i>Page</i>
1. INTRODUCTION	121
2. THE GOVERNMENT'S ROLE	121
3. FRESHWATER RESOURCES	121
4. CULTIVABLE SPECIES	121
4.1 Milkfish	122
4.2 Carps	122
5. MANPOWER	123
6. DEMONSTRATION FISH FARMS	123
7. ANNUAL PRODUCTION	123
7.1 Present status	123
7.2 Production potential	123
8. REFERENCES	124

1. INTRODUCTION

The need to determine the maximum attainable yield of all the usable food producing resources is important to any country with a high population growth. Increased production of fish is an essential part of any programme to avert food supply shortages.

This paper evaluates the production possible from various freshwater units under an intensive programme of fishery management. The data were taken from results of field studies actually performed in fish culture under local conditions and observations made by different fishery biologists during the last few years.

2. THE GOVERNMENT'S ROLE

The Bureau of Fisheries and Aquatic Resources (BFAR) under the Department of Natural Resources (DNR) is the agency of the Government of the Republic of The Philippines delegated to take charge of the development and exploitation of the aquatic resources of the country.

3. FRESHWATER RESOURCES

The freshwater resources of The Philippines have an aggregate area of 948 596 hm².

There are various types of freshwater unit which are grouped under the following categories: (i) lakes, (ii) swamps and marshes, (iii) dams and reservoirs, (iv) rivers, (v) fishpond and (vi) irrigated ricefields.

Lakes are natural impoundments with a total area of 199 462 hm². There are 69 recorded lakes which constitute more than 21 percent of the total freshwater area.

An estimate of 186 688 hm² are swamps which represent 20 percent of the total freshwater area. However, there are certain portions of the swamplands which are manageable for fish production during the rainy season, only, a period of 6 months in a year.

Man-made impoundments have a total area of 28 420 hm² and constitute about 3 percent of the water area. They are mainly used for generation of power and for irrigation. Twelve different units have been constructed in Luzon which is the biggest island of the country.

There are only 19 026 hm² of freshwater fishponds composed of 154 different units so far recorded which represent about 2 percent of the total freshwater resource. The potential area for this type of fish culture is estimated to be 250 000 hm².

A total of 1 437 different river systems are irregularly distributed throughout the country representing an area of about 15 000 hm² which is 1 percent of the freshwater area.

Irrigated ricefields have a total area of 500 000 hm² and constitute 53 percent of the total freshwater. This resource can be increased to double the present area on full development. Please refer to Table 1.

4. CULTIVABLE SPECIES

Although there are about 170 species of freshwater fish in the country, only a few cultivable kinds are treated in this report. These include those fishes raised in impounded waters and other species which have been successfully bred in hatcheries and found to be reasonably practicable for transplanting in lakes, dams, reservoirs and other inland bodies of water.

The reasons for limiting consideration to only a few species are as follows:

- (a) Maximum utilization of water resources seems to be achieved by polyculture of carps in combination with local compatible species.
- (b) The breeding of milkfish, *Chanos chanos* (Forsk.) locally known as bangos, has been suggested for many years and is now gaining support for research by government and fisheries workers.

Breeders are obtainable in certain sectors of the country at any time of the year and if they can be successfully spawned in captivity, it will undoubtedly solve the problem of fish food deficiency. A fully matured breeder contains millions of eggs.

- (c) The maximum limit of reproduction by natural spawning of endemic species has already been attained and is now on the wane. No amount of effort can increase their capacity to reproduce unless the ecosystem is restored to its normal state.

4.1 Milkfish

Milkfish fry abound in the coastal waters and seek rivers and streams to find their way into inland bodies of freshwater where they spend about two years of their life. Then they migrate back to the sea where they become sexually mature and spawn.

The culture of milkfish in brackishwater ponds has been an established industry for centuries. The present investment in the industry is roughly estimated to be no less than P.Ps. 1 billion.

With the introduction of fish pens in some lakes, the culture of bangos was found to be very profitable. The average annual harvest amounts to 10 t of fish per hm^2 . There are about 7 000 hm^2 of fish pens established in Laguna de Bay representing an investment of P.Ps. 140 million.

A field study was conducted in Lake Mainit, which has a water surface area of 14 848 hm^2 , by stocking the lake with bangos fingerlings. A total of 400 000 fingerlings was planted in the lake in 4 consecutive years. Two years after the first planting, bangos ranging from 75 cm to 1 m in total length were observed to migrate "en masse" downstream toward the sea during April and May. There were 3 fish corrals at the mouth of the river draining the lake and each of them can catch from 50 to 200 individual bangos per day. The average daily catch by one fish corral was about 75 fish. Each fish weighs from 7 to 8 kg with a selling price of P.Ps. 5 at the time of survey.

During other months of the year, 3 to 4 bangos were caught daily by each fish corral. The percentage recovery for 1 year was computed to represent 6.5 percent of the total fish stocked within a four-year period.

From these figures, it has been demonstrated that the benefits from fish stocking in a single year were more than threefold the total amount invested.

4.2 Carps

Common carp, *Cyprinus carpio*, was first introduced into Lake Lanao of The Philippines in 1915. This was followed, in 1925, by an introduction into Lakes Bubi, Bato and Baao of Camarines Sur of the same species originating from Canton, China. In 1927 common carp from Canton were stocked in Laguna de Bay and Paoay Lake. Formosan carp (also common carp) were introduced into the country in 1928.

Although a variety of common carps from different countries have been brought into The Philippines, their introduction was not intended for fish culture but for dispersal into various freshwater systems. No evaluation study was undertaken with respect to their biology in any of the bodies of water where they were planted.

In 1966 the need for appropriate cultivable species in the development of freshwater fish culture led to the importation of various species of carps. For three consecutive years the following species were imported from different countries:

Common name	Scientific name
1. Common carp	<i>Cyprinus carpio</i>
2. Silver carp	<i>Hypophthalmichthys molitrix</i>
3. Bighead carp	<i>Aristichthys nobilis</i>
4. Mud carp	<i>Cirrhina molitorella</i>
5. Catla	<i>Catla catla</i>
6. Grass carp	<i>Ctenopharyngodon idella</i>
7. Rohu	<i>Labeo rohita</i>
8. Mrigal	<i>Cirrhina mrigal</i>

The common carp has been reported to reproduce in some places where they were originally planted. Silver carp, bighead carp and grass carp were reported to breed in Pampanga River.

Rohu, the Indian major carp, was successfully spawned through hormone injection at Tanay Demonstration Fish Farm.

The maximum size of rohu planted in one of the dams after three years was 24 kg and was reported to breed naturally in the same body of water.

5. MANPOWER

The pond fisheries training course was started in July of 1971 and six groups of participants, 272 participants and 18 observers, have graduated up to the present time. The main objective of the course is to equip the participants with appropriate knowledge and skills of the principles, techniques and methods of freshwater fisheries with emphasis on the propagation of cultivable species under local conditions. The fifth training course conducted from 6 to 17 January, 1975 was extended to ASEAN member countries (Thailand, Singapore, Malaysia, Indonesia and The Philippines).

The Philippine participants posted to various strategic production centres to assist the fishpond operators improve their yield using the knowledge they have acquired from the course.

6. DEMONSTRATION FISH FARMS

There are now eleven freshwater demonstration fish farms located at different places within the country demonstrating the breeding of various cultivable species and raising them to fingerlings. Each farm has been allocated to produce a definite quantity of fish seeds for dispersal into the different bodies of freshwater. A limited number of fingerlings are distributed free of charge to fishpond operators. Training on the breeding of fish in the hatcheries is also given.

The establishment of additional fish farms for breeding of cultivable species have been proposed to intensify the production of fingerlings.

7. ANNUAL PRODUCTION

7.1 Present status

There are 69 different lakes with a total area of 199 462 hm². Approximately 19 946 t of fishery products are harvested annually which constitute about 41 percent of the total yield from freshwater fisheries.

The annual production of irrigated ricefields, although the estimated area is 500 000 hm², amounts to only 10 000 t which is about 20 percent of the total freshwater harvest.

From swamps and marshes covering an area of 186 688 hm², the annual production was estimated to be 9 334 t representing 19 percent of the total freshwater yield.

The harvest from freshwater fishponds with an area of 19 026 hm² amounts to 5 708 t which is 12 percent of the total annual production from freshwater areas.

The annual yield from dams and reservoirs amounts to 2 842 t while the river output is only 750 t. Their combined production of 3 592 t represents only 7 percent of the total freshwater yield.

The present total production derived from freshwater fisheries with an aggregate area of 948 596 hm² is 48 580 400 kg or 48 580 t of fish. Please refer to Table 2.

7.2 Production potential

The potential of the freshwater fishery resources can be accelerated to a relatively high level of production under a well-organized programme of fish culture development.

By utilizing all the available areas for freshwater fishpond production with a possible area of 250 000 hm², a total output of about 875 million kg or 875 000 t of fish can be raised annually. This was based on an estimated 3 500 kg hm⁻² year⁻¹ resulting from field tests in demonstration areas.

The lakes, dams and reservoirs with an estimated annual production capacity of 500 kg hm⁻² can yield 114 731 000 kg or 114 731 t of fish.

Swamps and marshes are expected to produce about 37 337 600 kg or 37 338 t of fish annually.

The harvestable fishery products from rivers and irrigated ricefields will amount to 4 500 000 and 50 million kg respectively or with a total produce of 54 500 t.

An aggregate yield of 1 081 568 600 kg or 1 081 569 t of fish would represent the total annual production potential of freshwater fishery resources (Table 3).

8. REFERENCES

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TABLE 1

THE GEOGRAPHICAL DISTRIBUTION OF VARIOUS TYPES OF FRESHWATER UNITS

Locations	Kinds and number of units				
	Lakes	Swamps and marshes	Dams and reservoirs	Rivers	Fishponds
1. Ilocos Norte	1		1	12	2
2. Ilocos Sur	1			16	1
3. Abra	2			18	8
4. La Union			1	15	
5. Cagayan	1	13		42	2
6. Bontoc				7	
7. Ifugao				7	
8. Benguet			2	9	4
9. Apayao				25	
10. Kalinga				5	
11. Isabela		1		28	1
12. Pangasinan	2	4		37	7
13. Nueva Ecija	1	2		30	11
14. Nueva Viscaya				38	
15. Pampanga		2	1	16	44
16. Tarlac				13	5
17. Zambales	2			17	11
18. Bulacan			1	28	2
19. Bataan				41	
20. Rizal			4	15	10
21. Cavite				5	
22. Laguna	11		2	26	4
23. Batangas	1			26	2
24. Quezon	2	7		128	14
25. Camarines Sur	3			43	1
26. Camarines Norte				18	1
27. Sorsogon	1			19	
28. Albay				5	1
29. Catanduanes				6	1
30. Marinduque				9	
31. Masbate		4		96	1
32. Ticao				1	
33. Burias		1		2	
34. Polilio				27	
35. Mindoro	3			215	2
36. Samar				53	
37. Romblon		1		28	
38. Leyte	8			115	
39. Bohol				10	
40. Surigao	2			5	
41. Agusan	1			26	
42. Misamis Oriental				13	
43. Bukidnon	2			13	1
44. Lanao	8			16	3
45. Misamis Occidental				11	
46. Zamboanga	1			8	
47. Cotabato	10	2		41	7
48. Davao				30	3
49. Negros Oriental	3			5	2
50. Negros Occidental				18	2
51. Palawan	1				1
Total	69	37	12	1 437	154

Note: Creeks and unnamed rivers not included

TABLE 2
PRESENT STATUS OF PRODUCTION OF FRESHWATER UNITS

<i>Freshwater Units</i>	Annual Production		
	<i>Area (hm²)</i>	<i>Unit of Production (kg hm⁻²)</i>	<i>Total Production (kg)</i>
1. Lakes	199 462	100	19 946 200
2. Swamps and marshes	186 688	50	9 334 400
3. Dams and reservoirs	28 420	100	2 842 000
4. Rivers	15 000	50	750 000
5. Fishponds	19 026	300	5 707 800
6. Irrigated ricefields	500 000	20	10 000 000
Total	948 596		48 580 400

TABLE 3
ESTIMATED PRODUCTION POTENTIAL OF FRESHWATER FISHERIES ON FULL DEVELOPMENT

<i>Freshwater Units</i>	Annual Production		
	<i>Area (hm²)</i>	<i>Unit of Production (kg hm⁻²)</i>	<i>Total Production (kg)</i>
1. Lakes	199 462	500	99 731 000
2. Swamps and marshes	186 688	200	37 337 600
3. Dams and reservoirs	30 000	500	15 000 000
4. Rivers	15 000	300	4 500 000
5. Fishponds	250 000	3 500	875 000 000
6. Irrigated ricefields	1 000 000	50	50 000 000
Total	1 681 150		1 081 568 600