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PRODUCTION ANALYSIS OF MILKFISH CULTURE IN KENDAL REGENCY, CENTRAL JAVA, INDONESIA

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PRODUCTION ANALYSIS OF MILKFISH CULTURE IN KENDAL REGENCY, CENTRAL JAVA, INDONESIA

By

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Thesis Submitted in Partial Fulfilment of the Requirements for the Degree of Master of Science in the Faculty of Economics and Management, Universiti Pertanian Malaysia

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July 1992

Supervisor : Assoc. Prof. Sahak Mamat, Ph.D.

Faculty : Economics and Management

Low productivity is one of the serious problems in milkfish culture in Central Java, Indonesia. According to the Department of Fisheries Services of Central Java, the average annual production is about 526 kg per hectare. This average output is less than one third of that achievable in Taiwan. Therefore, it is expected that this yield can be increased. The question, then, is how to increase this yield. One way of approaching this problem is to examine factors that may affect the level of production in milkfish culture within the framework of a Cobb-Douglas production function. In this study, yield was specified as a function of six variable inputs (fry, labour, bestan pesticide, teodan pesticide, fertilizer and feed) and one fixed input (pond area).

Individual variability of farmers such as their educational level, experience, participation in farmers organizations, and being

visited by extension officials are also believed to affect milkfish yield. Therefore, these factors were also included in the regression model as independent variables.

Aside from low productivity, a low level of income is also obvious among milkfish farmers. The interesting question is how this low income could be increased in order to enable the farmers to survive. The way of approaching this problem was to examine the optimum rate of input use and to analyse the normalized restricted profit function, which we specified as a function of six normalized prices of variable inputs mentioned earlier.

The results of this study indicate that all variable inputs hypothesized to explain yield variations in milkfish culture were significant except for pond area. It was also found that sociological factors hypothesized, except the number of visits by extension officials, did influence yield significantly.

The analysis on the optimum rate of inputs used also indicates that current input levels can be further raised in order to increase profitability.

Abstrak thesis yang dikemukakan kepada Senat Universiti Pertanian Malaysia sebagai memenuhi sebagai memenuhi sebahagian daripada syarat dikurniakan Ijazah Master Sains

ANALISIS PENGELUARAN IKAN PISANG-PISANG DI DAERAH KENDAL, JAWA TENGAH, INDONESIA

oleh

Hamroli Harun

Julai 1992

Penyelia : Prof. Madya Sahak Mamat,

Fakulti : Ekonomi dan Pengurusan

Daya pengeluaran yang rendah adalah merupakan salah satu masalah utama yang dihadapi di dalam perikanan pisang-pisang di Jawa Tengah, Indonesia. Mengikut Jabatan Perkhidmatan Perikanan Jawa Tengah purata keluaran tahunan di sana ialah 526 kg sehektar. Purata pengeluaran tahunan ini adalah merupakan satu per tiga dari apa yang dapat dicapai di Taiwan. Purata pengeluaran yang rendah ini dipercayai boleh dipertingkatkan. Persoalannya ialah bagaimanakah purata pengeluaran yang rendah ini boleh di-pertingkatkan.

Salah satu daripada cara mendekati masalah ini ialah dengan mengkaji faktor-faktor yang mempengaruhi tahap pengeluaran ikan pisang-pisang menerusi fungsi pengeluaran Cobb-Douglass. Menerusi kaedah tersebut hasil pengeluaran telah ditentukan sebagai fungsi enam faktor input berubah (anak ikan, buruh, racun

bestan,

(kawasan kolam).

Perbezaan individu di kalangan penternak-penternak seperti tahap pencapaian akademik, pengalaman, penglibatan penternak di dalam pertubuhan peladang,

oleh pegawai-pegawai pengembangan terhadap seseorang penternak juga dipercayai mempengaruhi tingkat pengeluaran.

faktor tersebut telah juga diambil kira sebagai pembolehubah di dalam model regressi berkenaan.

Selain dari daya pengeluaran yang rendah,

patan yang rendah juga adalah nyata di kalangan penternak-penternak.

dapatan yang rendah ini boleh dipertingkatkan untuk membolehkan penternak-penternak berkenaan hidup lebih selesa.

mendekati masalah ini ialah dengan mengkaji kadar penggunaan input optimum dan menganalisis fungsi keuntungan yang telah ditetapkan sebagai satu fungsi harga-harga enam input berubah seperti yang telah dinyatakan terlebih dahulu.

Keputusan kajian ini menunjukkan bahawa kesemua input, kecuali kawasan kolam, mempunyai kesan yang signifikan terhadap perubahan dalam tingkat pengeluaran. Kajian ini juga mendapati bahawa kesemua faktor-faktor sosiologikal yang tersebut di atas, kecuali bilangan lawatan yang dilakukan oleh pegawai-pegawai

pengembangan, juga dengan signifikannya mempengaruhi tingkat pengeluaran.

Analisis dari penggunaan input yang optimum juga menunjukkan bahawa penggunaan input boleh dipertingkatkan lagi bagi tujuan meningkatkan lagi keuntungan di kalangan penternak-penternak.

CHAPTER I

INTRODUCTION

The Fishery Sector of Indonesia

The economy of Indonesia is primarily agriculture. The agriculture sector is important in terms of its contribution to gross domestic product (GDP) and as a source of employment and foreign exchange earnings to the Indonesian economy. In 1983 Indonesia's agricultural sector contributed 35 percent to the country's GDP and provided employment for about 60 percent of the total labour force in the country. Due to its importance in the national economy, agriculture, including the fishery sub-sector, has been chosen as the central focus for the country's development effort since the implementation of the First Five Year Development Plan in 1969.

Fishery products contributed about 6 percent to the real agricultural GDP[1] in 1983. They also contribute significantly to employment and income for the people in rural areas. In 1984, sea fishing and brackish water fisheries provided employment to 1,294,472 and 1,150,294 fishermen respectively.

Fishery products of Indonesia are from both inland and marine and coastal fisheries. They are either captured or cultured. The total fish production of Indonesia from both sub-sectors increased from 1,849,662 tons in 1980 to 2,260,989 tons in 1984.

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[1] Real agricultural GDP in 1983 was 17,696.2 billion rupiah.

Marine and coastal fish contributed the largest proportion to the total fish production:

in 1984 (Table 1).

Table 1

Indonesian Fish Production (Tons), 1980, 1984

Sources	1980	1984
Brackishwater ponds	97,898	142,404
Freshwater ponds	66,379	76,528
Rice fields	35,495	58,880
Cages/others	582	1,052
Inland open waters	254,498	269,321
Sea	1,394,810	1,712,804
Total	1,849,662	2,260,989

Source: Fisheries Statistics of Indonesia, Department of Agriculture, Jakarta, 1984

Fishery products also represent a principal source of animal protein for Indonesians. In 1983, the average per capita consumption of fishery products was 15.2 kg (Susumu Awanohara, 1984). Besides for domestic consumption, Indonesia also exports fishery products.

1983. Due to the increase in population and income, the demand for fishery products in the country is increasing.

To meet these increasing demands, the Government of Indonesia has implemented several programmes to increase fish production. Fishery authorities expect that total Indonesian fish

production would increase by 5.8 percent a year from 2.3 million tons in 1984/85 to 2.8 million tons in 1988/89. This production increase is expected to come primarily from aquaculture, since aquaculture production processes can be controlled and enhanced through proper input use as opposed to capture fishery which depends on natural stocks and environment. In addition, attempts have also been made to fully utilize the available natural water resources of the country for aquaculture purposes.

Indonesia is rich in natural water resources which can be utilized for coastal aquaculture fishery. She has about 1,382,000 km^2 of continental shelf area and more than 61,000 km of coastline which account for 14 percent of the world's coastline. Aquaculture production accounted for 10 percent of total fishery production in 1980 and 12 percent in 1984. It increased from 200,354 tons in 1980 to 278,864 tons in 1984 (Department of Agriculture, 1984). In the long run, it is envisaged that fish culture in Indonesia would have at least the same potential as marine fisheries. Marine fisheries potential within Indonesia territorial waters is estimated at 6.5 million tons per year, of which 70 percent or 4.5 million ton per year is the maximum sustainable yield (Birowo, 1978).

Central Java Fisheries

The Central Java Province lies between 108° - 111° East of Meridian and 6° - 8° South of equator. It is bordered by the Java Sea in the South and West Java Province on the west. There are 35

regencies and municipalities in Central Java Province. The municipality of Semarang is the provincial capital.

Fishery products contribute about 3 percent of the real agricultural gross regional domestic product of the province. The fisheries sub-sector contributes significantly in terms of employment and income for the people of Central Java. Sea fishing alone provides employment for 64,950 people, while inland fisheries provides 54,104 employment for the rural people in the province.

Total fish production from both sea and inland fisheries in the Central Java province has been fluctuating. Total production decreased from 150,822 tons in 1979 to 135,108 tons in 1982. The decline in total production was due to the decline in the catch of marine fish from 121,247 tons in 1979 to 97,713 tons in 1982 (Table 2). However, inland fishery production increased from 29,574 tons to 37,393 tons within the same period. It is believed that the major reason behind the decrease in the catch of marine fish is the limited stock available within the north coast of Central Java. The situation is aggravated by the increase in the number and the capacity of fishing fleets in the area which might result in overfishing.

Central Java Province is rich in natural water resources which can be utilized for coastal and inland aquaculture. In 1982, Central Java produced about 20 percent of total

country. Aquaculture production in this area is predominantly milkfish. Milkfish culture is an important means of subsistence for the people in the north coast of Central In 1982 milkfish culture

Table 2

Central Java Fish Production (Tons): 1979, 1982

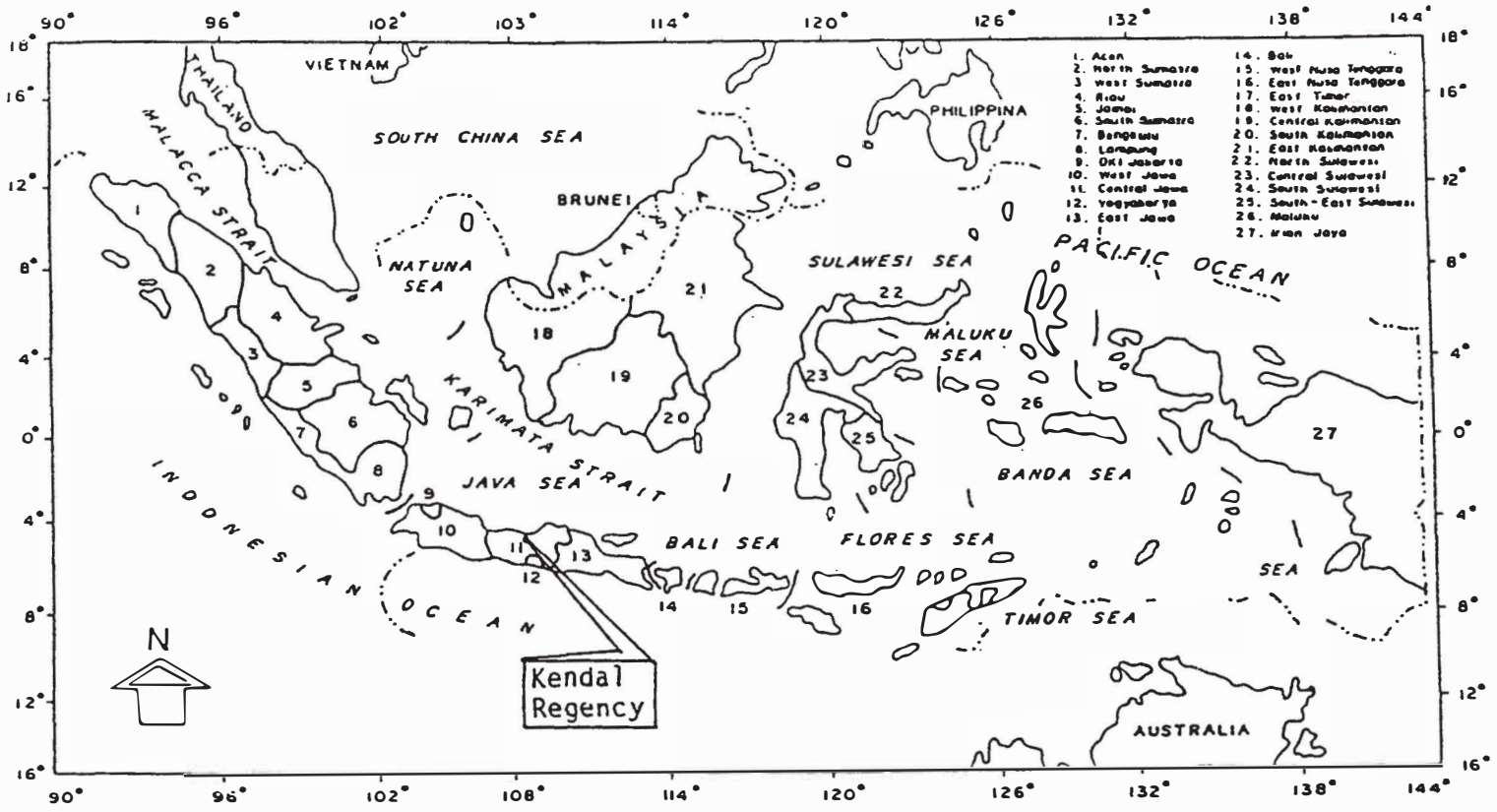
Source	1979	1982
Brackishwater ponds	12,571.7	14,383.2
Freshwater ponds	7,253.3	11,708.4
Rice field	238.5	662.9
Inland open water	9,513.0	10,640.5
Sea	121,247.5	97,713.1
Total	150,822.0	135,108.1

Source: Fisheries Statistics, Central Java Fisheries in Figure 1982, Semarang, Indonesia, 1983

provided some 18,295 jobs for farmers with a total production of 14,383 tons. On average, the yield is about 562 kg per hectare per year.

There are 13 coastal regencies (kabupaten) along the northern coast of Central Java. One of them is Kendal (Figure 1). The distance bet-ween Kendal Regency and the provincial capital (Semarang) is about 29 km. The size of Kendal Regency is about 1,002.23 km^2 with a population of 722,720.

Milkfish aquaculture is very important for the Kendal Regency. In 1982, a total of 3,734 hectares of coastal area of Kendal were devoted to milkfish culture which provided employment for a total of 1,514 farmers. Total milkfish production was 1,480 tons, with an average yield of about 396 kg per hectare per year. Milkfish production of Kendal Regency accounted for 40 percent of total



Source: Adopted from Susilowati (1991) and modified accordingly by the author

Figure 1: Map of Indonesia by Provice Showing the Location of Kendal Regency

fishery products in 1982. Table 3 shows fish production from the total fishery sub-sector of Kendal Regency for 1982.

Table 3

Kendal Regency Fish Production (Ton): 1982

Source	1982
Brackishwater ponds	1,480
Freshwater	22
Inland open water	157
Sea	2,088
Total	3,747

Source: Central Java Fisheries in Figure (1982), Fisheries Service of Central Java, Semarang, Indonesia

Milkfish Culture Operation

Milkfish culture in Indonesia has been practiced since the Middle Ages. The first milkfish culture pond was built on the initiative of a "wali" (travelling teachers of Islam) in East Java; it then spread out to Central and West Java.

The history of milkfish culture in Central Java can be traced back to the construction of milkfish culture ponds in Semarang in 1820, and one which was started in 1860 in Demak Regency. From here, milkfish culture spread along the north coast of Central Java.

Milkfish culture operation is managed along agriculture lines, but it is physiologically much more sensitive than a rice field or an

orchard. The risk in milkfish operations is high, since many things can happen to fish under a calm water surface, and it is not so easy to detect what is going on. Operators must be alert all the time to find out such indicators which may cause trouble.

Milkfish culture ponds are generally constructed by first digging a broad, shallow ditch along the sides of a square plot of land. Soil removed can be used to build the dykes. The dykes are closed by placing a watergate which will face a nearby canal from which water will flow in and out of the pond (Figure 2).

There are various problems with a newly constructed pond. The risk of the dyke breaking is great. Ponds are quickly filled with silt. These are some of the reasons why milkfish culture is only undertaken about four years after pond construction. By then, the dykes become strong and the risk of loss is reduced. Before a pond is stocked with fry, it must be cleaned from trash fish, including the predators.

The main rearing ponds have to be drained till the shallow bottom is exposed to sunlight and air for several days. The surface of the pond bottom will soon be covered by a bloom of algae which is the main food for milkfish. This is also the time to fertilize the pond by broadcasting or submerging fertilizer five centimenters below the pond surface. The main objective of using fertilizer is to induce the growth of algae. To reduce predators, some pesticides have to be applied. When the algae bloom is sufficient, water is allowed to fill the pond and the fry are released into the pond. The fry are poured

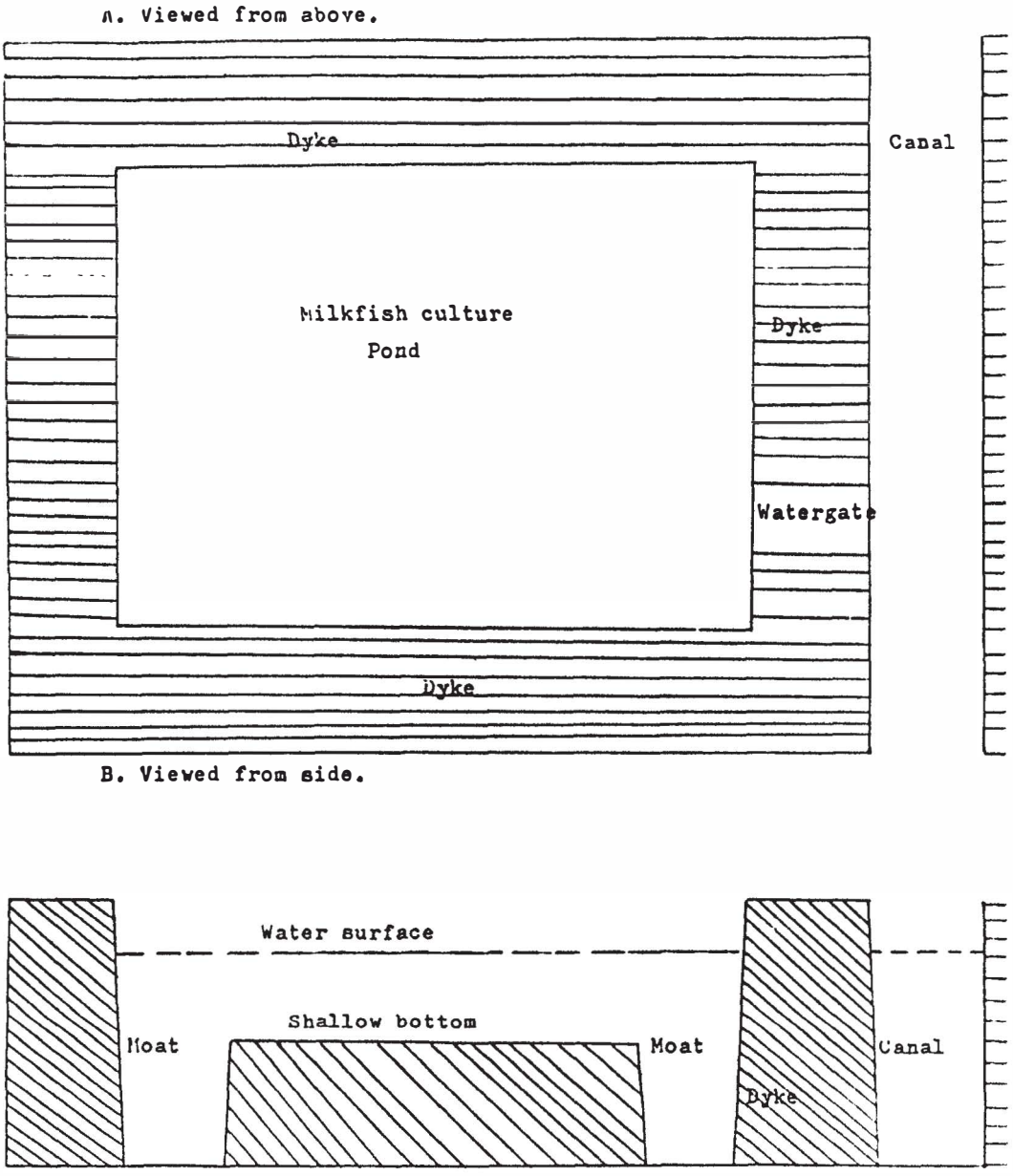


Figure 2. Sketch of Milkfish Culture Pond

slowly into the nursery pond in order to reduce the temperature difference. This is usually done in the morning or at sun set.

Generally, each pond can be harvested twice a year. The main product of the pond is milkfish, but there are other species of fish in the pond. At every filling of a pond, different kinds of fry are swept into the pond. No pond can be kept absolutely free from trash fish, so their existence must be made useful.

Statement of the Research Problem

It is generally believed that productivity among the milkfish farmers in Kendal Regency is low (Fisheries Service of Central Java, 1982). Several studies (Diponegoro University, 1972, 1974, 1975) on milkfish culture of Central Java have reported that:

(1) Milkfish culture pond operation is still traditional,

(2) The application of new inputs and technology is uncommon, and

(3) The level of production is low.

According to the fisheries offices of Central Java Province (1982), the average annual production of milkfish of Kendal Regency is 396 kg/ha while the average productivity from Central Java is only 529 kg/ha. In comparison, the average yield per unit of pond in Central Java is about a third of that achieved in Taiwan (Toto Sugito, 1978). It is, therefore, believed that the productivity of milkfish