

Shrimp Farm Performance and Financial Commitments Related to Disease Out-breaks : The Sri Lankan Case

by

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Shrimp farming started in Sri Lanka in mid 1980's. It has now become a main non-traditional foreign exchange earner. Sri Lanka has exported 2,700 mt. of shrimps worth of Rs. 2,400 million (Fig. 1) during the year 1996. The national farm population is around 925 with an estimated area of about 3,500 ha. allocated for shrimp farming. All the shrimp farms are located along a narrow coastal belt of around 120 km in the North Western Province of Sri Lanka.

Due to high demand, resulting high prices, high profits, and the breakthrough in culture technology, shrimp culture had expanded rapidly in the North Western Province. However, its growth has slowed down since mid 1996 due to disease outbreak and problems linked to environment. The information provided here on farm performance is based on a survey conducted by Asian Development Bank (ADB), Network of Aquaculture Centers in Asia-Pacific (NACA) and the National Aquatic Resource Research and Development Agency (NARA) on aquaculture sustainability and the environment.

Physical performance

Majority of the shrimp farms in Sri Lanka are classified under semi-intensive and intensive levels. The factors considered in this classification include stocking density, infrastructure facility available and feed use. More than 90% of the farms in Sri Lanka are operated at semi-intensive level. The annual physical performance of semi-intensive and intensive shrimp farms

is summarized in Table 1. Relatively high feed conversion ratios were observed for both culture systems. Mean production levels were considerably higher in intensive systems, but the prices fetched for shrimps produced in semi-intensive farms were relatively low.

Annual grow out performance

The operating costs in shrimp farming include feed, seed, power, labor and other costs such as fertilizer and lime (Table 2). Both semi-intensive and intensive farms performed considerably well before the year 1995. The calculated total potential shrimp production in Sri Lanka is around 8,300 mt. with a farm level value of about \$ 56 million. The actual total production has been fluctuating around 3,000 mt. Rapid uncontrolled expansion, self

Table 1

Annual physical performance of semi-intensive and intensive shrimp farms in Sri Lanka	Semi-	Inten-
	intensive	sive
Period between harvest and next stocking (days)	57	94
Number of culture cycles per year	1.7	1.6
Mean production (kg/ha/year)	4663	7801
Average prize of marketed shrimp (\$/kg)	6.70	7.84
Average stocking density (post larvae / m ²)	15	22
Feed consumption (kg/ha)	9033	15577
Feed conversion ratio	1.93	1.99

Source: Jayasinghe, 1995.

Table 2

Annual grow out pond performance of semi-intensive and intensive shrimp farms in Sri Lanka	Semi - Intensive	
	Intensive	Intensive
Revenue from shrimp sales (\$/ha)	30916	60851
Total farm output (\$/ha)	31250	61156
Costs:		
Labor cost (\$/ha)	2332	4561
Feed cost (\$/ha)	11293	19625
Seed cost (\$/ha)	3174	4283
Power (\$/ha)	1214	2900
Other direct costs (\$/ha)	589	1240
Overhead cash costs (\$/ha)	1538	2510
Depreciation (\$/ha)	2829	2959
Total costs (\$/ha)	22968	38079
Interest (Calculated, \$/ha)	114	490
Net margin (\$/ha)	8167	22588
Cash margin excluding imputed inputs (\$/ha)	10966	25547

Source: Jayasinghe, 1995.

pollution, increased pathogen population, introduction of new pathogens to the environment, reduction in mangrove and salt marsh coverage, silting of water ways and complete closure of river out falls restricting the tidal movements have reduced the capacities of the environment. These factors may be considered responsible for the difference between the potential and actual shrimp production.

The major annual costs of the shrimp farming industry include, feed \$ 18 million, labor \$ 4.5 million, seed \$ 5.7

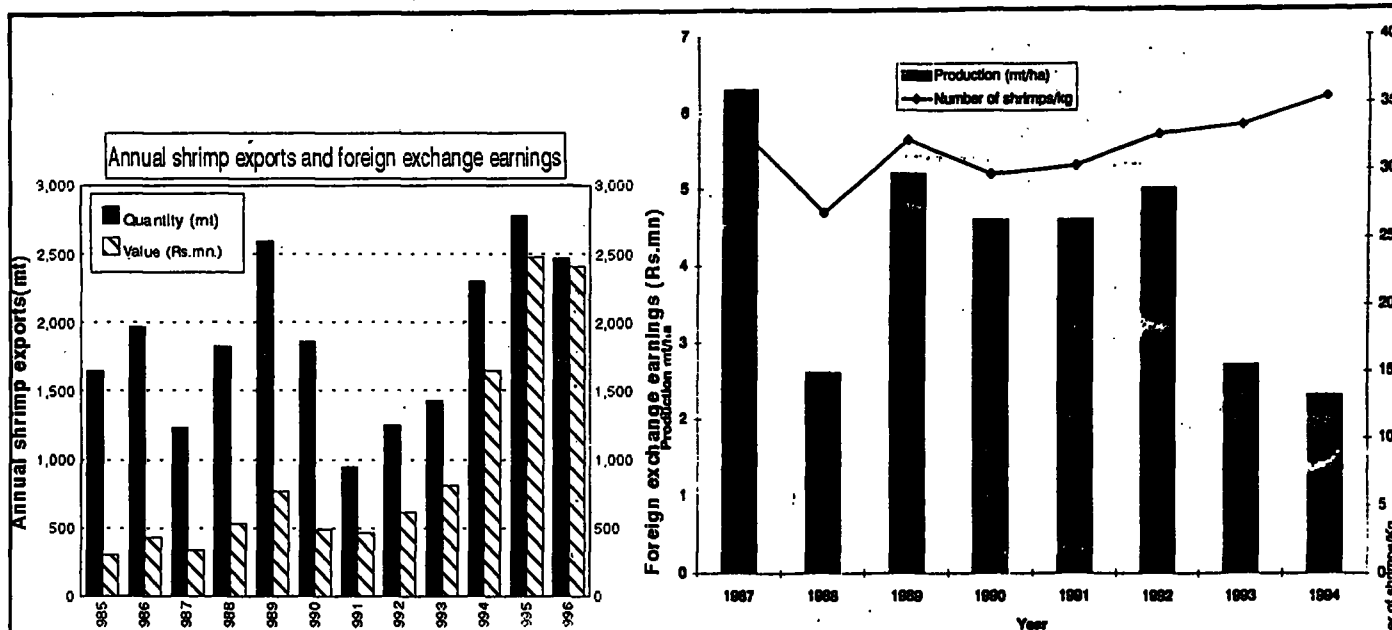


Figure 2. Trends in annual pond production and harvest size of shrimps. (source: Jayasinghe, 1995).

million and power \$ 2.2 million. Overhead cash costs totalled \$ 3.7 million and depreciation \$ 4.5 million resulting in a national net margin of \$ 16.5 million. Value added by the sector is approximately \$ 21 million, derived by adding the cash cost of labor to the national net margin.

Several timeseries trends have been identified in farm performance, some of which will require further investigation. A decreasing trend has been observed in the mean total production (mt/ha) in recent years (Fig. 2). The highest production, 6.3 mt/ha was recorded during the year 1987 but reduced drastically to 2.6 mt/ha the following year. It recovered during successive years. The total production has dropped from 5.0 mt. in the year 1992 to 2.3 mt/ha in 1994. The number of shrimps needed for a kilogram has increased during recent years indicating a decreasing trend in the size of the harvested shrimps.

Comparative advantage's and productivity of Sri Lanka's shrimp culture industry

The world's farm shrimps amounted to 712,000 mt. in 1995 and Asia produced about 78% of the farmed shrimps. Thailand is the leading shrimp producer followed by Indonesia, China, India and Vietnam. The contribution of Sri Lanka to the world's cultured shrimp market is still very low.

When comparing the cost structure

of the Asian semi-intensive shrimp farming systems (Fig. 3) production cost per kilogram of shrimp (US \$ 4.4) in Sri Lanka is lower than that in India and Malaysia but is higher than the cost in China, Vietnam, Indonesia and Philippines. Feed cost dominates the production cost followed by seed cost. Shrimp is usually graded by size and sold by counts (numbers/kg.) in the international market. Shrimp species, size and country of origin are important features of international shrimp trade and are reflected in price differences in the shrimp exports. Sri Lanka, together with Malaysia and Thailand receive relatively high prices in the Japanese market. Sri Lanka's shrimp fetch the highest price in the US market according to 1994 statistics.

The resource cost ratio (RCR) is used as a measure of comparative advantage. A country has a comparative advantage in the production of exportable shrimp if the opportunity costs of producing, processing, marketing, and transporting an incremental unit of shrimp are less than the export prices in the world market. When compared to other Asian shrimp producing countries, Thailand, Indonesia and Sri Lanka with lower RCR values have considerably a higher comparative advantage than the other shrimp farming countries of Asia.

Aquaculture Asia (1996) has indicated that Sri Lanka shows consistently high productivity in the different farming practices followed by shrimp

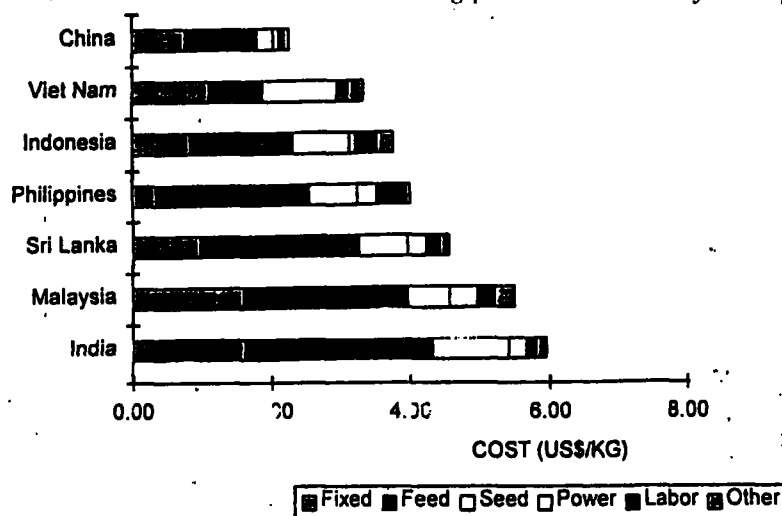


Figure 3. Comparison of the cost structure of Asian semi-intensive shrimp farming (source: Aquaculture Asia 1996).

farming countries of the India-Pacific region. When comparing the input uses, labour use (person days/ha) is highest in Sri Lanka. In all shrimp culture systems shrimp farmers in Sri Lanka use relatively a high quantity of feed when compared with the regional averages.

Constraints of the shrimp farming industry

The shrimp farming industry in Sri Lanka in its short history has faced two severe crisis periods due to epidemics. The first epidemic. The first epidemic was during the year 1988 due to Monodon Baculo Virus and the pathogen responsible for the second out-break was white spot virus. Cumulative mortalities up to 100% were recorded within a few days of first detection of symptoms in the latter out-break. The disease was first recorded in farms bordering the Dutch canal and the Me-oya estuarine area of the Puttalam lagoon in May 1996. The typical sign exhibited by the sick shrimps was white-spots on the inner surface of the carapace. Some affected shrimps exhibited slightly reddish dark colour and loss of appetite. The disease spread very rapidly to other brackish water systems and more than 90% of the farms became non-functional within a few months. Farmers restarted their culture activities during the third quarter of the year but they were stricken by a second out-break of the same disease by mid December 1996.

Relatively high salinities in the brackish water sources for shrimp culture is another climate related factor that adversely affects the shrimp farming industry in addition to the general degradation of the brackish water environment. The accepted salinity range is between 5 and 35 ppt. while the most favorable range lies between 15 to 25 ppt. The salinities higher than 40 reduce growth and production. Very high salinities observed in the upper reaches of the Mundal lake and the portion of Dutch canal which connects the Mundal lagoon with Puttalam lagoon during a greater part of the year restrict farming activities.

Financial constraints

The losses in foreign exchange earnings due to white spot disease are

estimated at Rs. 1,000 million for the year 1996. The term loans obtained by the industry from banks amount to Rs. 650 million. Farmers are unable to repay the loan installments and interest. The main support industries affected are hatcheries, ice plants and processing plants. A considerable number had lost their employment opportunities. Urgent need has now arisen to rehabilitate the industry to prevent virtual collapse and to increase the sustainability of the industry.

Financial commitments in rehabilitation

Present management strategies of the shrimp farming industry in Sri Lanka have to be modified to minimize the risks of white spot out-breaks and similar epidemics in future. Proper pond preparation, water management, sediment management and the management of feed will contribute to minimize the stress and will improve the general health status of the shrimp. Healthy shrimps are less vulnerable to infections. Less than 5% of the farms had facility to treat effluents before the out-break of disease. This allowed carriers to move freely in and out of the farming systems. One of the most urgent needs is to change the present management strategies and to restructure the farms to minimize the risks of future out-breaks. Size of the farm and the economic status of the farmer, have to be considered in changing management procedures and restructuring ponds.

Majority of our farming population are small scale operators with farms less than 1 ha in extent. Individual farmers are unable to allocate an area for water storage or sedimentation. Corporate arrangements between three to four farmers will allow enough space for a common sedimentation area for them to operate. Sedimentation or water storage is one of the most cost-effective ways to suppress SEMBV out-breaks. Since free virus cannot survive in aquatic medium for more than forty eight hours, storage of water for more than two days will eradicate the free living pathogen. Prevention of the entry of carriers through nets when pumping water will minimize the risk of the spread of virus through carriers.

Chemical treatment of the pond

before stocking post larvae is practised by the majority of the small scale farmers in Thailand. Chlorination is effective in eradicating carriers. Water is treated with chlorine and dechlorinated later, with the use of paddle wheel aerators. Ponds are then stocked with post larvae. Water is not exchanged for a period of about ten to twelve weeks but exchange starts after this period with risk. The targeted maximum size of harvest is around twenty two grams. Disadvantages of this system include low natural productivity, low plankton growth, and the risk of the entry of pathogen after ten weeks when water exchange starts. Farmers use chlorine to treat water in reservoir tanks when necessity arises. The cost of chlorination varies with the amount and strength used. Generally it is more than Rs. 25,000 per cycle depending on the doze and the situation.

Majority of the medium scale farms are around five ha. in extent. These farmers can restructure their farm incorporating reservoirs/sedimentation tanks for incoming water. Environmental sustainability can be improved by including the facility to treat effluents discharged to the natural brackish water environment. The reservoir can be further differentiated into sedimentation area and area for chemical treatment, if the farmer wants to treat water chemically before taking it into culture ponds. Chemical treatment is effective in suppressing bacterial population in water and sediments. The restructuring cost can vary between Rs. 200,000 to Rs. 300,000 per ha. in medium scale farms.

Complete recirculation of water will minimize the risk of out-breaks. Minimal water exchange with the natural environment can enhance the capacities of the environment. The major components of the complete recirculation system include inlet, reservoir / sedimentation pond, treatment ponds, feeder canal, culture ponds and a discharge canal. The water discharged is redirected to the reservoir / sedimentation tank. The main constraint is the large proportion of farm to be reserved for treatment. Around 40 to 70% of the total farm area is reserved for treatment area in farms practicing complete recirculation system. The cost of

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restructuring one hectare is more than Rs. 250,000 per hectare and is suitable for larger farms.

Since white spot virus can be transmitted vertically, use of virus free brood stock for larval production and use of healthy larvae in culture ponds are essential. Rapid diagnostic methods are now available for the detection of white spot virus. Control of carrier population and avifauna is also equally important. There is a recent trend to use probiotic bacteria in ponds to improve the general pond environment and to suppress the pathogenic bacterial population. The cost incurred in the use of probiotics can be up to Rs. 100,000 / ha. / crop depending on the brand

