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## FOUR DECADES OF INLAND FISHERIES AND AQUACULTURE DEVELOPMENT IN SRI LANKA

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### Abstract

A capture fishery at the subsistence level was in existence in the 1960s and 1970s with the introduction of *Oreochromis mossambicus* into man-made lakes and reservoirs in Sri Lanka in the mid 1950s. With the first policy decision by the government in the early 1970s to enhance fish production from inland water bodies, Chinese and Indian major carps were introduced to Sri Lanka inland water bodies after its successful artificial insemination at the Freshwater Fish Breeding & Experimental Stations (FWFB&ES) at Udawalawe and Dambulla during the mid to late 1970s and 1980s. The government also introduced a boat and fishing gear subsidy scheme and a pond subsidy scheme to enhance inland freshwater fish production during the same period. Under the first Asian Development Bank funded Inland Fisheries & Aquaculture Development Project (IFADP), funds were provided to develop Culture Based Fisheries (CBF) and for shrimp hatchery and farm development. All these efforts by the government succeeded in enhancing inland fish production from 8331 MT in 1970 to 39,900 MT by 1989.

With the ceasing of government patronage to inland fisheries and aquaculture development in 1990, the inland fish production dropped to 12,000 MT in 1994. With the re-establishment of government patronage in 1995, the inland fisheries and aquaculture development programmes were recommenced. The shrimp aquaculture programme initiated by the government in mid 1980s

continued undeterred due mainly to the resilience of the private sector amid problems of shrimp disease which affected the industry. In order to give greater autonomy to the Inland Fisheries Development Division (IFDD), the National Aquaculture Development Authority (NAQDA) was established by an Act of Parliament in 1998, which took over the overall inland fisheries and aquaculture development, including the shrimp aquaculture and ornamental fish breeding programmes. Inland fish production from capture and aquaculture from 1970 to 2010 is presented in this paper. Also, the government contributions and its effects from 1999 to 2010 after NAQDA was established have been presented and discussed. It is seen that the cost to the government in relation to inland freshwater fish production was Rs. 4.27 per Kg of freshwater fish. During 1999 and 2010 a total quantity of 439,570,000 Kg of freshwater fish was produced, bringing in a total revenue of Rs. 43,957,000,000 (Rs. 43.96 BN at the modest rate of Rs. 100 per Kg of freshwater fish), which has been added to the rural economy.

### **Abbreviations**

ADB	- Asian Development Bank
ACIAR	- Australian Centre for International Agriculture Research
AQDC	- Aquaculture Development Centre
ARDQIP	- Aquaculture Resource Development & Quality Improvement Project
ASD	- Agrarian Services Department
BN	- Billion
CBF	- Culture Based Fisheries
DOFAR	- Department of Fisheries & Aquatic Resources
FO	- Farmer Organization
FS	- Fisheries Society
GTZ	- German Technical Programme
IFADP	- Inland Fisheries Aquaculture Development Project
IFDD	- Inland Fisheries Development Division
MIS	- Management Information Systems
MN	- Million
MOFAR	- Ministry of Fisheries & Aquatic Resources
MT	- Metric Tons
NAQDA	- National Aquaculture Development Authority

PA	- People's Alliance
ROI	- Return on Investment
SEAFDEC	- South East Asian Fisheries Development Centre
SFM&EU	- Shrimp Farm Monitoring & Extension Unit
UNP	- United National Party
USD	- United States Dollars

## Introduction

Sri Lanka is blessed with vast inland freshwater and brackish water resources amounting to 261,941 ha and 150,000 ha respectively, as illustrated in Table 1. In the early 1960s and 1970s, a freshwater fish capture fishery was in operation at the subsistence level with the introduction of *Tilapia mossambica* in to perennial man-made lakes in Sri Lanka in the early 1950s. Today, nearly 90% of the inland freshwater fish production is from capture fisheries from perennial reservoirs. This was as a result of the first policy decision by the then government and its concerted efforts in the mid 1970s, to increase freshwater fish production from inland water resources, due to the limitations placed on marine coastal and off-shore fisheries resources.

Table 1 – Sri Lanka Freshwater Resources

Resource Type	Area (Ha)
Major irrigation reservoirs	70,850
Medium irrigation reservoirs	17,004
Minor irrigation reservoirs	39,271
Seasonal tanks	100,000
Flood lakes (Villus)	4,049
Upland reservoirs	8,097
Mahaweli reservoirs	22,670
Total	261,941
Brackish water resources	150,000

Source: Ministry of Fisheries & Aquatic Resources

Among the measures taken by the government to increase freshwater fish production in the mid to late 1970s were, stock enhancement of inland water bodies by stocking fingerlings of Chinese and Indian carps produced through artificial breeding, using brood stock of Chinese and Indian major carp imported from the People's Republic of China and India respectively and increasing the catching effort by encouraging local fisher folk mainly agricultural farmers living close to inland water bodies to engage in fishing. Fishing boats and gear were issued to these fishermen on a 90% subsidy as an incentive. As a result of these efforts of the government, the inland fish production increased from 8,331 MT in 1970 to 20,200 MT by 1980 (Figure 1).

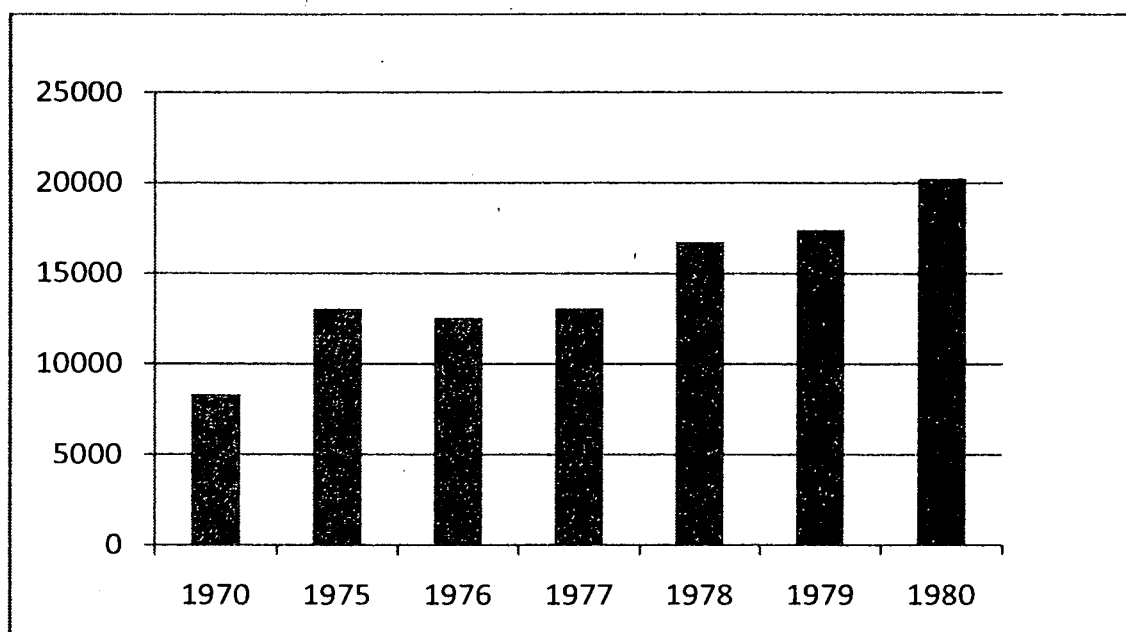


Figure 1 – Inland fish production (1970 to 1980)  
 Source : Ministry of Fisheries & Aquatic Resources

Another measure initiated by the government and implemented in the early 1980s through to 1989 was the Culture based Fishery (CBF) in seasonal and minor perennial tanks. Initial practical trials were conducted with a loan secured from the Asian Development Bank (ADB) in the early 1980s under the first Inland Fisheries and Aquaculture

Development Project (IFADP) and with the support of the Agrarian Services Department (ASD) under which seasonal tanks were operated to provide water to agricultural needs of the farmers. In CBF, the fingerlings of Chinese and Indian carps were stocked in seasonal tanks with the onset of monsoonal rains during November to January of each year and the fish were harvested when they reached marketable sizes from the sixth month onwards till the tanks went partially or completely dry within 8-9 months time. The tanks were looked after by the Farmers' Organizations (FO), who managed and regulated the release of water for agriculture irrigation purposes. In CBF, unlike in capture fisheries there was a resource ownership, the produce belonging to the members of the Fisheries Society (FS), functioning within the FOS, formed by some members of the FOS who were engaged in the fishing activity.

Although the government's attempts in the 1970s and 1980s to develop capture fisheries and CBF in perennial and seasonal tanks respectively were successful, its programs to encourage pond fish culture of freshwater or brackish water species failed to produce significant results due to four reasons. Firstly, Sri Lanka did not have a practical tradition for freshwater or brackish water fish culture for the production of food fish and as a means of livelihood, unlike her Southeast Asian neighbours, at least not until the early to mid eighties. Secondly, due to the ready availability of sea fish throughout the country in a matter of hours, consumers even in rural areas were used to consume sea fish. Thirdly, for poor rural folk who are predominantly Buddhists, partaking of fish cultured in ponds, harvested and killed, was against the philosophy. The fourth and the most significant reason was the non-viability of commercial pond culture operations for freshwater fish, as the

market prices for freshwater fish were comparatively lower than other land animal products.

However, with CBF getting into top gear during the 1980s, it was possible to increase the inland fish production from both capture fisheries and CBF to 39,900 MT by the year 1989 (Figure 2).

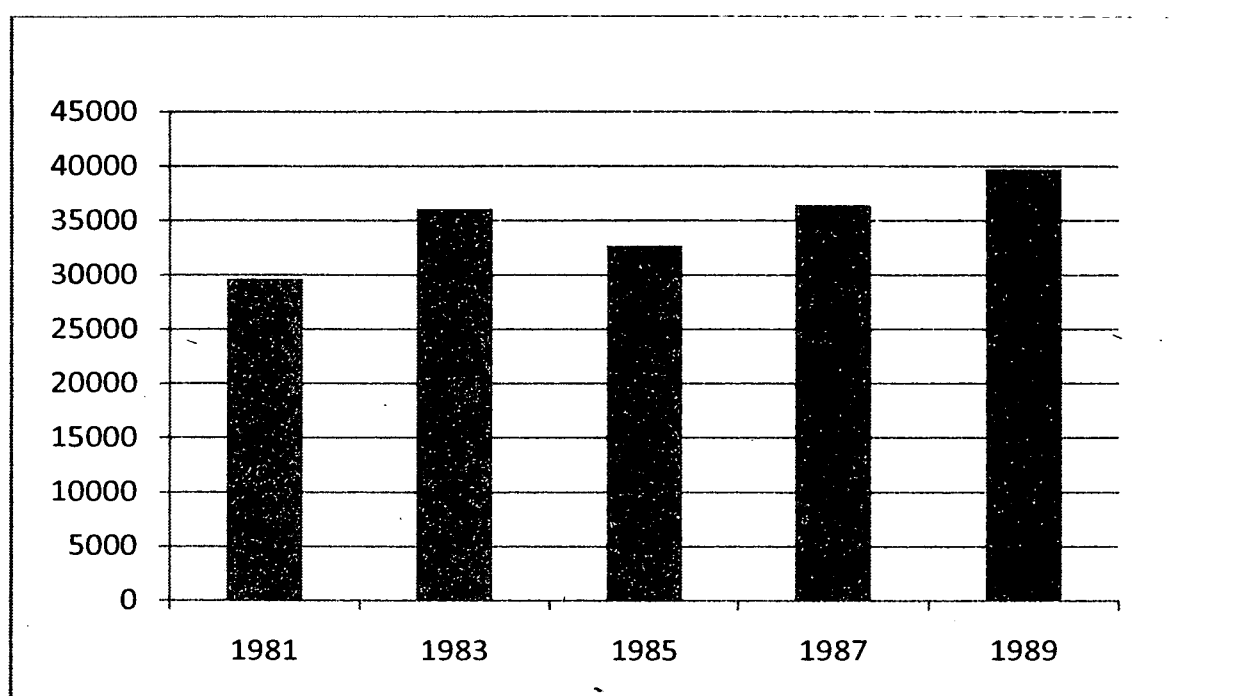


Figure 2 – Inland fish production (1981 to 1989)  
Source : Ministry of Fisheries & Aquatic Resources

### **Developments in shrimp aquaculture**

Along with the development of CBF, the ADB also provided funds to develop and promote shrimp aquaculture in the North Western Province (NW) in the early 1980s. Under this programme, the ADB provided funds for the construction of a ‘Turn Key’ shrimp hatchery and shrimp production farm in Arachchikattuwa in Chilaw. It also provided a credit line to the local commercial banks to provide loans to prospective shrimp farmers to engage in this activity. This action acted as a trigger for the rapid development of shrimp farming in the Eastern and the NW

provinces. Due to the enormous Returns on Investment (ROI) resulting from shrimp aquaculture, many small and large scale investors belonging to all communities irrespective of their different religious beliefs, were drawn into this venture.

### **1990 policy decision on inland fisheries & aquaculture**

In 1990, the government decided to cease State patronage for inland fisheries and aquaculture. The reasons for this decision may have been due to the immense pressures brought on the government by the Buddhist clergy who were against the pond fish culture concept and the international financing institutions who were against subsidies offered by the government for the development of inland fisheries and aquaculture. This decision brought disastrous consequences to inland fisheries and aquaculture programmes, which affected the inland fish production mainly and the loss of livelihoods for the inland fisher community. The inland fish production decreased to 12,000 MT in 1994 from a high of 39,900 MT in 1989. The main reasons for this loss in production was due to unregulated fishing activity by fishermen using unauthorized fishing gear, lack of stock enhancement of reservoirs with fish fingerlings and the collapse of CBF activities due to the lack of fingerlings\* and proper extension services (Figure 3).

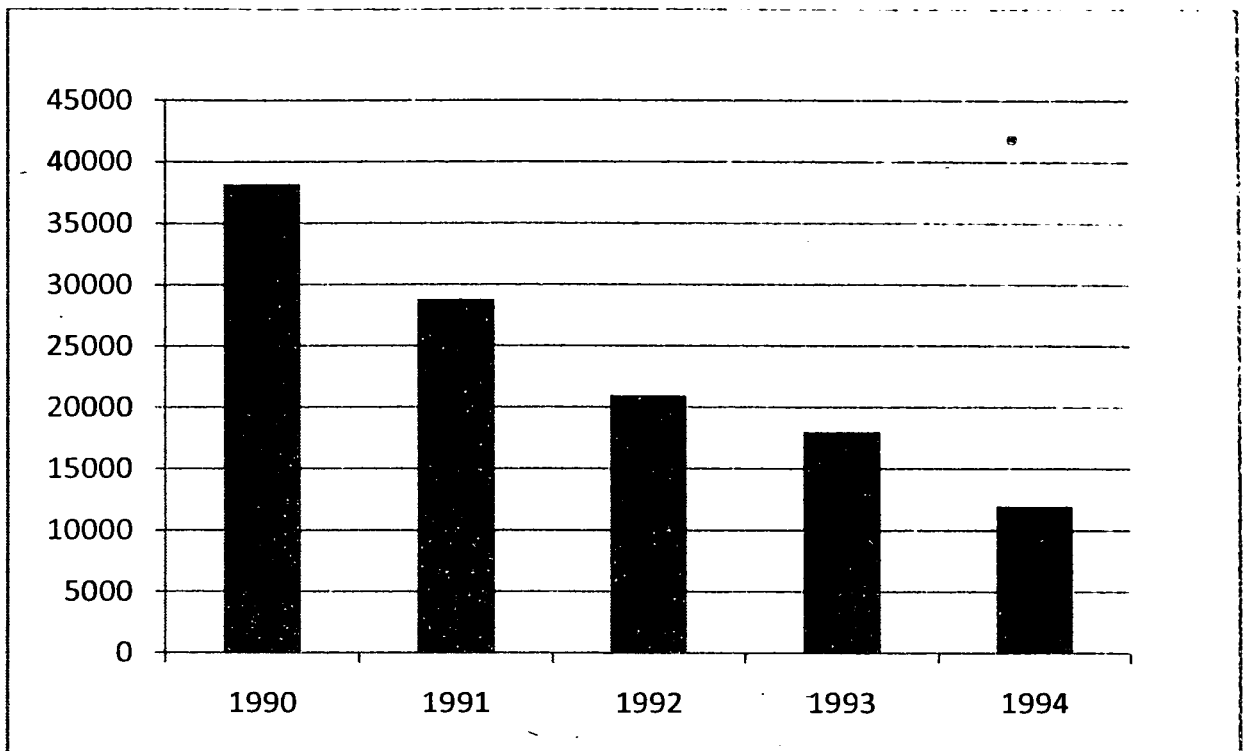


Figure 3: Inland Fish Production (1990-1994)  
 Source : Ministry of Fisheries & Aquatic Resources

However, this policy decision did not affect shrimp aquaculture ventures of the private investors, who continued to develop this industry on their own, triggered by the enormous ROI factor. This industry continued to grow amid disease outbreaks in the late 1980s and early 1990s mainly due to the resilience of the private investors, who trained their technical staff overseas mainly at courses offered by the South East Fisheries Development Centre (SEAFDEC) in Ilo Ilo, the Philippines.

**1995 policy decision on inland fisheries & aquaculture**

With the new government being elected to office in 1995, steps were initiated to re-establish State patronage for inland fisheries and aquaculture development. Three of the main Aquaculture Development Centres (AQDCs) at Udawalawe, Dambulla and Inginiyagala which were involved in producing the much needed fish fingerlings for the stock



enhancement programme prior to 1990 and were leased out to the private sector during 1991 to 1995 period, were retaken by the government. The fish fingerling production of Chinese and Indian major carps was re-established and the stock enhancement programme was recommenced. In 1997/1998 period, the National Aquaculture Development Authority (NAQDA) was founded under Act No. 53 of 1998. This was done to give some degree of autonomy to the former Inland Fisheries Development Division (IFDD) of the MOFAR which was in existence prior to 1990. NAQDA continued to perform most of the programmes carried out by the former IFDD. The importance of CBF as a means of livelihood development and fish production was recognized by two Non Governmental Organizations (NGOO), vis-à-vis the German Technical Co-operation Programme (GTZ) and the Australian Centre for International Agricultural Research (ACIAR), who funded the development of CBF in the Hambanthota, Monaragala, Ratnapura, Anuradhapura and Kurunagala districts. The much needed fingerlings for these two programmes were supplied by NAQDA.

During this period, the ADB also stepped in to assist the inland fisheries and aquaculture development programme of NAQDA by providing funds amounting to United States Dollars (USD) 30 MN under the Aquaculture Resource Development & Quality Improvement Project (ARDQIP). This project commenced activities in 2003 and continued till 2009 fulfilling its mandate completely. Among the main programmes under this project were, 1) infrastructure development, 2) assistance for CBF development, 3) strengthening of manpower resources through local and international training programmes, 5) conducting

awareness programmes for inland fishers 6) strengthening the aquaculture extension through management information systems (MIS) and 7) providing a line of credit for aquaculture development.

As a result of all these activities, the fish production from inland capture, CBF and aquaculture increased to 46,560 MT by 2009. Increase in fish production from inland fisheries and aquaculture from 1999 to 2010 is given in Figure 4.

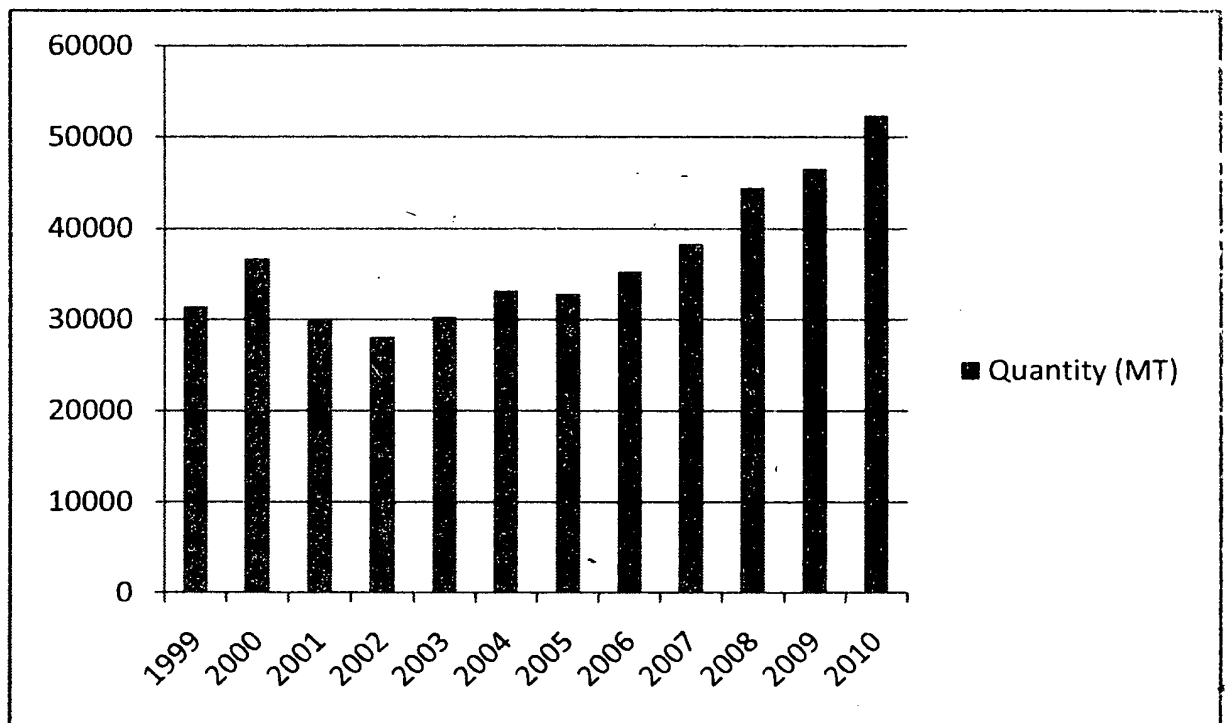


Figure 4 – Inland fish production (1999 to 2009)  
Source : Ministry of Fisheries & Aquatic Resources

### **Shrimp aquaculture industry 1995 to 2010**

The shrimp farming industry continued to boom from the late 1980s to the mid 1990s amid a few hiccups due to the advent of disease problems. Up to 1995, the industry functioned according to the rules and regulations incorporated into the agreements of the investors by the SCOPING Committee. However, with the change of government in 1995, a number of unauthorized shrimp farmers set up shrimp ponds in reservations left

over by the big investors and without SCOPING Committee approvals. This unauthorized farming gave rise to a number of problems among which the most significant ones being 1) flooding of the shrimp farming areas during heavy rains, thereby spreading diseases and 2) the non-availability of the much needed shrimp post larvae for stocking the farms. By this time the shrimp farming area had increased to around 4,500 Ha, far exceeding the maximum carrying capacity of the ‘DutchCanal’. The inability of the few shrimp hatcheries to supply the much needed post larvae to stock the shrimp farms, triggered the importation of shrimp post larvae into the country from Thailand and India. This importation was not regulated by the Department of Fisheries & Aquatic Resources (DOFAR) at that time. This also brought about the importation of the ‘White Spot’ disease virus into the country, which resulted in severe destruction of shrimp stocks and heavy losses to the industry from 1996 onwards. The Sri Lanka Export Development Board also stepped in at this crucial juncture to conduct awareness programmes on disease control with the assistance of INFOFISH and shrimp disease experts from Mahidol University of Thailand.

The industry continued its production amid ups and downs. The DOFAR by this time had drafted Aquaculture Regulations under its Act No. 2 of 1996 and prohibited/banned the importation of shrimp post larvae into the country. However, the implementation of Aquaculture Regulations was not effective and the shrimp farmers, especially the small time unauthorized ones continued to violate the regulations resulting in a near collapse of the entire industry in the year 2003. NAQDA stepped in at this time by taking over the regulation of the industry through delegation of authority from the DOFAR.

Among the measures implemented by NAQDA to control the spread of the 'White Spot' disease were 1) the establishment of a Shrimp Farm Monitoring & Extension Unit (SFM&EU) in Chilaw, 2) formulating and implementing of the 'Crop Calendar' to control haphazard farming, 3) Drafting of new Aquaculture Regulations as and when necessary, 4) conducting awareness programmes on shrimp disease control and Best Management Practices (BMPs), 5) formulating BMPs for shrimp farm management, shrimp hatchery production, shrimp brood stock collection and transport, use of chemicals in aquaculture, importation of shrimp feeds and post larval rearing and 6) conducting monthly meetings of Shrimp Farmers' Associations, shrimp feed importers, hatchery operators and shrimp processors to address issues and resolve problems of the industry.

Another and most significant action implemented by NAQDA to control the disease spread was to obtain funds from the Treasury for the purpose of opening of the sea mouths at Thoduwawa and Muthupanthiya in Chilaw in December 2004 and dredging the 'Dutch Canal' in areas where siltation had occurred. This dredging programme continued till 2009 with funds provided by the Treasury amounting to nearly Rs.150 MN for this activity. As a result of the above measures implemented by NAQDA, it was able to save the industry from near collapse and sustain the shrimp production to date. Shrimp production from aquaculture and shrimp exports from Sri Lanka from 1990 to 2010 are given in Figure 5.

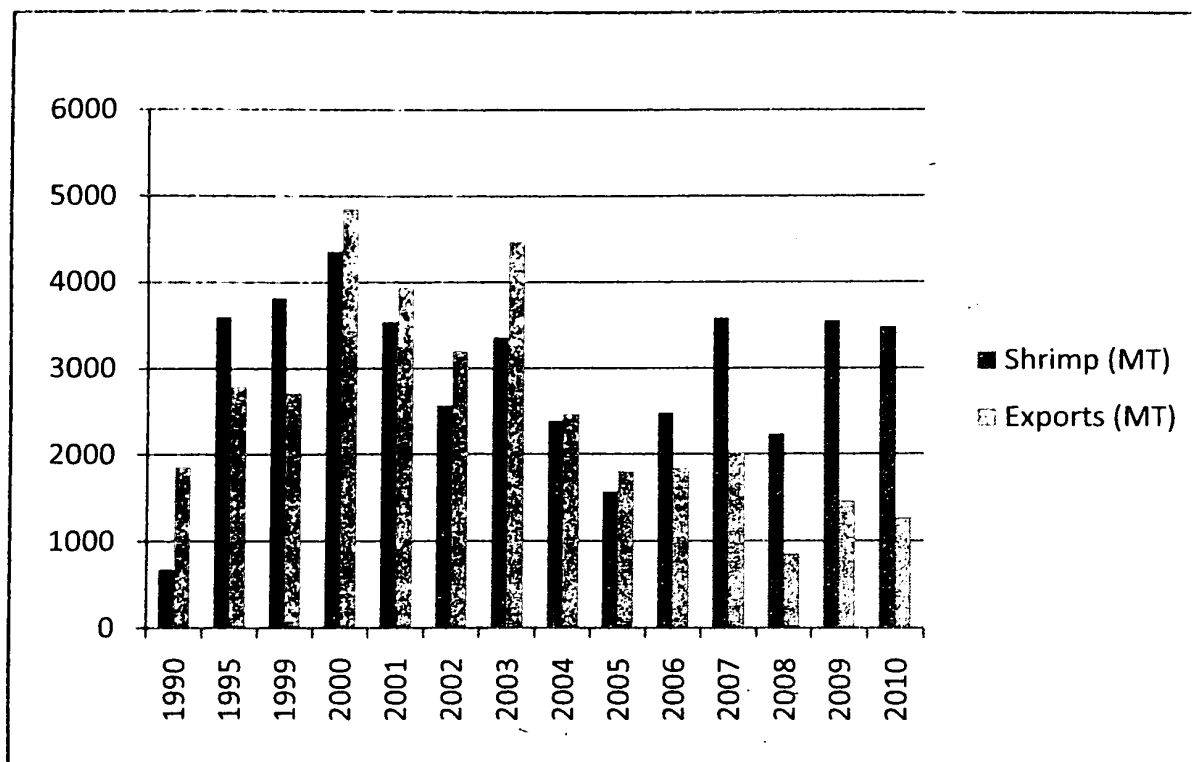


Figure 5 – Shrimp production from aquaculture and shrimp production for exports (from aquaculture & wild catch) from 1990 to 2010

Source : Ministry of Fisheries & Aquatic Resources

Shrimp exports comprises both from aquaculture and the wild catch from marine sources. The lower quantum of exports in certain years may be due to lower recovery rates during processing and more local sales than export sales.

### **Economics of inland fisheries & aquaculture development (1999 to 2010)**

The total annual government grants and project loan funds and the annual inland freshwater fish production for the years from 1999 to 2010 are given in Table 2. According to the data, the government had spent a total of Rs. 1,880,190,000 for the development of inland fisheries and aquaculture resulting in a production of 439,570,000kg of freshwater fish during the reporting period.

Table 2 – Annual government grants (Capital &amp; Recurrent Funds), Project loan funds and Annual freshwater fish production (1999 to 2010)

Year	Income category	Amount Rs. MN	Sub Total Rs.MN	Freshwater fish Production MT
1999	NAQDA income	0.92		
	Government grant	135.57		
			136.49	31,450
2000	NAQDA income	2.2		
	Government grant	55.90		
			58.10	36,700
2001	NAQDA income	4.5		
	Government grant	87.70		
			92.20	29,870
2002	NAQDA income	7.60		
	Government grant	70.20		
			77.80	28,130
2003	NAQDA income	7.00		
	Government grant	72.30		
			79.30	30,280
2004	NAQDA income	8.30		
	Government grant	82.30		
	ADB funds	8.77		
			99.37	33,180
2005	NAQDA income	13.30		
	Government grant	105.32		
	ADB funds	9.20		
			127.82	32,830
2006	NAQDA income	25.60		
	Government grant	119.60		
	ADB funds	11.21		
	Shrimp & exchange fund	34.84		
			190.60	35,290
2007	NAQDA income	27.80		

Year	Income category	Amount Rs. MN	Sub Total Rs.MN	Freshwater fish Production MT
	Government grant	163.00		
	ADB funds	14.95		
	Shrimp & exchange fund	21.13		
			226.88	38,380
2008	NAQDA income	31.60		
	Government grant	180.00		
	ADB funds	18.50		
	Shrimp & exchange fund	36.55		
		266.65	44,490	
2009	NAQDA income	27.40		
	Government grant	196.60		
	ADB funds	17.78		
	Shrimp & exchange fund	52.20		
		293.98	46,560	
2010	NAQDA income	27.00		
	Government grant	204.00		
	Grand Total		1880.19	439,570 MT
			1,880,190,000	439,570,000 Kg

Therefore, during 1999 to 2010 period, the cost to the Treasury per kg of freshwater fish has been Rs. 4.27.

When the total revenue from the sale of freshwater fish during this period is considered, it can be seen that a total sum of Rs. 43,957 MN (Rs. 43.96 BN) has been added to the rural economy (at an average wholesale price of Rs.100/- per kg).

## Conclusion

NAQDA was formed through an Act of Parliament in 1998 with the primary objective of developing inland fisheries and aquaculture to enhance fish production and through that, to provide livelihoods to rural fishers, to alleviate poverty and ensure food security, with a certain degree of autonomy enjoyed by public statutory organizations such as Boards and Corporations. It also meant that NAQDA could no longer function as the former IFDD of the Ministry of Fisheries (which was completely service oriented with total dependency on public funds) for its various programmes.

This meant that NAQDA could no longer issue fish fingerlings for the stock enhancement programme free of charge to Fisheries Societies (FS). The FS had to purchase the fingerlings to stock their reservoirs to enhance fish production. The members of FSS which carried out CBF activities in seasonal and minor perennial tanks also had to purchase fingerlings for stock enhancement each season from NAQDA's AQDCs. Sale of fish fingerlings therefore became one of the sole income earning activities of NAQDA and this income is shown in the Annual Reports of NAQDA as earned income (Table 2). However, this action acted as a spoiler to the free flow of fingerlings for stock enhancement enjoyed by the former IFDD and also brought about a slowing down of the rate of increase in inland freshwater fish production from inland reservoirs, through both capture and CBF. The members of the FSS, especially in major, medium and even some minor scale reservoirs showed some degree of reluctance to purchase fish fingerlings for stock enhancement of their respective reservoirs mainly because of 'open access fishery' (no resource ownership) in these reservoirs. However, the



CBF programme in seasonal tanks and most of the minor perennial reservoirs went on unhindered due to resource ownership of the fish stock by the members of the FSS who engaged in the fishing activity. They showed interest in purchasing the fish fingerlings for stock enhancement, as they were sure of a good ROI at the end of 7 to 8 months when the tanks went dry or the level of water was reduced to a minimum, at the height of the drought season.

Suggestions to reverse this decision to sell fish fingerlings and carry out free stocking of selected reservoirs for a five year period were met with fierce resistance from the NAQDA management due to strict Treasury policy on public corporations and statutory authorities. Further, the ADB funded ARDQIP was based on the principle of the sale of fish fingerlings to fishers, with a complete prohibition on free issues. In the year 2008 however, under a crash programme to increase inland freshwater fish production from inland water bodies, the government provided funds to NAQDA to purchase fingerlings from Community Based Organizations (CBOs) managed mini-nurseries and private pond operators, in addition to NAQDA's own fingerling production at AQDCs to carryout stock enhancement of inland water bodies as a service for a five year period. A clear increase in inland fish production is also seen (Figure 4), from the year 2008 onwards.

NAQDA continues to contribute to the enhancement of the rural economy through its efforts to increase fish production from inland water resources and from aquaculture. It has also contributed and still continues to achieve its main objectives of livelihood development, alleviation of poverty and ensuring food security. Therefore, NAQDA's

role as a public statutory organization, its productivity and accountability should be clearly viewed from the angle of the above salient facts and not just as a profit making organization like some other public corporations in Sri Lanka. Also, considering the enormous indirect ROI generated through NAQDA's mandate, it is recommended that more funds be allocated through annual budgets of the Treasury for NAQDA, to continue its role as a service organization, enabling it to achieve its objectives of livelihood generation, alleviation of poverty and to ensure food security for the rural masses.

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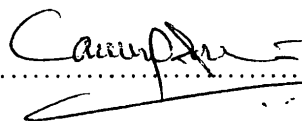
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