

## 21. FOOD SECURITY IN INDIA : AQUACULTURE AN OPTION

**Vijay, V. and Shyam S. Salim**

Central Institute of Fisheries Education

(Deemed University, ICAR)

Fisheries University Road

Versova, Mumbai - 400 061

### Introduction

Food, shelter & clothes are the basic necessities of the life and among them food plays a pivotal role in the social and economic development of country. Each and every person is entitled to an equal right to access food. However there are people who are not getting even minimum requirement of food even for their life sustenance. In a developing country like India food security is a major social concern. Approximately 25 % of people in India are Below Poverty Line(BPL) are not able to afford food available in the market even though food is physically accessible. In the country we have people still not deprived of the pangs of hunger and malnutrition. Deficiency in required nutrients like proteins, vitamins, minerals may cause various type of ailments.

Green Revolution, which led to the rapid spread of high yielding rice and wheat varieties in the 1960s and 70s have augmented the food grain production in India. From a cereal importing nation India has turned into an exporter with a surplus buffer stock. However, the affect of Green Revolution is waning. Public investments in agriculture are declining and the annual increment to Gross capital formation in agriculture is now lower than in the early 1980s.

The population of India is increasing exponentially in comparison to food grain production. Besides the increased population, other factors like limited land area available for agriculture, reduction in productivity of the land, high input costs, etc. are a real stumbling block for increasing the agricultural production. This bleak scenario necessitates the search of new avenues for the food security of the country. This scenario thrusts the projection of aquaculture as an option to meet the challenges of the food security of the nation. If the potential of aquaculture is tapped adequately will give the ultimate option in this regard to cater the country's 1.3 billion people by 2030 A.D with improved nutrient nourishment with animal protein.

### Food Security : The Concept

Food security essentially means that all people at all times have access to safe and nutritious food to maintain health and active life. This definition implies 3 dimensions

to food security, namely, availability, access and stability at various levels of aggregation, i.e., global, national household and the individual. Conventionally, food security is defined as the balance of food supply and effective demand food. This definition reason the concept of availability to all people food security refers to self sufficiency of food within the territory as export of food is always uncertain about prices of availability when needed.

Importance of maintaining food security the world over has been abundantly recognised since long. This aspect was first recognised at the 1974 World Food Conference where FAO was called upon to establish a committee on World Food Security so as to keep the world food situation under constant review. Subsequently, an International Undertaking on World Food Security was set up in which Member Nations committed themselves to food stocks at levels necessary to ensure continuity of supplies and to meet emergency needs.

The need for food security arises primarily due to the fluctuations in food plan and non-availability of sufficient food from domestic sources. As said earlier, insufficient income to purchase food supplies is the primary reason for saturation. Dr.Amaratya Sen, the eminent Noble prize winner economist, in his scholarly work on the Great Bengal Famine, has attributed the death of millions to the inadequacy, or rather non-existence of an official policy, to cope with the food supply crisis.

Social issues are relevant in the context of food security. The comprehensive development of agriculture, health, nutrition education, literacy, etc. would alone lead to enduring solution to the problem of food insecurity, poverty alleviations, unemployment and social tension in the region.

### **Agricultural Productivity on the Decline**

Achieving food security has been the over-riding goal of agricultural policy in India. However, the stagnation in availability of farm land has produced a scenario whereby horizontal production is almost next to impossible. At the same time, increasing shares of total public expenditure on agriculture are allocated to input subsidies (on fertilizers, electricity, irrigation and credit), rather than to productivity enhancing investments such as research. The share of input subsidies in public expenditure increased from 44% in the early 1980s to 87% by 1995. Private investment in agriculture has increased modestly in years, but not large enough to fill the gap left by the decrease in public investment.

**Table 1 : Population Projections For 2020 A.D. In India (million)**

<b>Year</b>	<b>Population</b>
2000	1000.3
2020	1329.1

As can be seen from the data of population growth and food grain production growth, the population is not keeping up to the optimum level of food production.

Maintaining and achieving the targets of food security appears to be a daunting task, especially when growth in production has to come exclusively from growth in productivity. This evolving scenario will change the supply and demand prospects for food in the next century. Thus, this slowdown in the growth of Total Factor Productivity (TFP) in cereals will affect prospects of cereals in India; consequently, efforts regarding to find a replacement for agriculture has to be made. In this context, aquaculture is showing promising signs of an emerging frontier to provide the much needed food security for the denizens of India.

**Table 2 : Food Production and Demand in India**

Year	Production of demand (000 tones)
<b>Rice</b>	
1995	78106
2000	84255
2030	113893
<b>Wheat</b>	
1995	59213
2000	62545
2030	80087
<b>Maize</b>	
1995	9818
2000	10281
2030	12786
<b>Other coarse grains</b>	
1995	20453
2000	21419
2030	26825
<b>Total cereals</b>	
1995	167589
2000	178500
2030	233681
<b>Milk</b>	
1995	66861
2000	82451
2030	158325
<b>Animal fats</b>	
1995	1465
2000	1808
2030	3471

<b>Meat</b>		
1995		4488
2000		5918
2030		13534
<b>Eggs</b>		
1995		1582
2000		2086
2030		4770
<b>Fish</b>		
1995		4632
2000		6108
2030		13971

Projected demand for various food products in 2030 for increased income at 5 GDP per capita and increased population are given in the tables. The increased demand for food grains is smaller than the increased demand for fishery products and livestock products. However, horticultural products show higher rate of income elasticity of demand.

**Table 3 : Demand for Energy from Major Food Groups as Percentage of Total Dietary Energy Demand**

Sl. No.	Food Group	Year	Per Capita GDP	Percentage
1.	Food groups	1995	3.5 %	68.46
		2000	3.5 %	64.0
		2030	5.5 %	60.0
2.	Horticultural products	1995	3.5 %	5.8
		2000	3.5 %	7.6
		2030	5.5 %	8.9
3.	Livestock and fisheries	1995	3.5 %	7.3
		2000	3.5 %	9.8
		2030	5.5 %	11.7
4.	Other food items	1995	3.5 %	18.2
		2000	3.5 %	18.6
		2030	5.5 %	18.8
5.	Daily per capita energy in Kilocalories	1995	3.5 %	2188
		2000	3.5 %	2294
		2030	5.5 %	2389

The demand for energy from major food groups as percentage of total Dietary Energy Demand is given above. It clearly shows that increased income leads to more energy consumption through fishery products of livestock as an alternative to food grains.

**Table 4 : Required Increase in Production by the Year 2030 over the existing 1994 – 96 Average Production to Meet the Domestic Demand in India**

Food item	Required rate of production
<u>Low income growth ( 3.5 % per capita GDP growth )</u>	
Rice	41
Wheat	35
Maize	45
Other coarse grains	32
Total cereals	38
Pulses	64
Total food grains	40
Roots and tubers	67
Edible oil	40
Sweeteners	37
Vegetables	135
Fruits	121
Milk	108
Meat	142
Eggs	146
Fish	121
<u>High income growth ( 5.5 % per capita GDP growth )</u>	
Rice	41
Wheat	30
Maize	38
Other coarse grains	25
Total cereals	35
Pulses	76
Total food grains	38
Roots and tubers	84
Edible oil	48
Sweeteners	42
Vegetables	202
Fruits	178
Milk	152
Meat	224
Eggs	229
Fish	195

The above table shows the required increase in food production by the year 2030 over the average production to meet the domestic demand in India, for both low and high income growth taken at 3.5% GDP per capita growth of 5.5% per capita GDP growth respectively. The tables show that horticultural and animal food production is to be increased by more than 2 folds, which is the indicator of greater demand for them, whereas grains and cereal production are not in greater demand. Fishery products being a cheaper source of protein superior ones will have a greater demand.

All these aspects point out to the undeniable fact that aquaculture is bound to play a crucial role in the policy making of the Indian fisheries economists on food security.

### **Aquaculture : An Overview**

Fisheries sector is one of the fastest growing sector in the world as well as in India, contributing to national income, exports, food and nutritional security and employment generation. Fishing was practiced in the country since time immemorial. However, till recently it was a supplementary of subsistence activity practiced by the people of coastal region.

Lately, however, the aquaculture scenario is undergoing a transformation in response to market forces and technological changes. The synergy has started taking the form of competition. The demand for fish has been rising gradually, putting stress on the natural fishing resources. The output from marine resources is limited due to indiscriminate exploitation. This demand supply gap has to be filled in by the aquaculture sector particularly. The world aquaculture production has been growing at a phenomenal rate of 10% a year since mid-eighties. In recent decades, aquaculture has emerged in a big way and is now being viewed as a major competitor of the land based activities for land and other resources.

It is estimated that India's population will cross 1.4 billion mark by 2020 A.D. Demand for fish is likely to be increased in the coming years at the present level of GDP (1.4%) the demand will be around 9.5 million tonnes. This means the country has to double its fish production by 2020 A.D in order to sustain at least the present level of fish consumption. According to a recent study conducted by the Indian Institute of Management, Ahmedabad around 56% of the Indian population are fish-eaters and the per capita consumption is now calculated as 9.5 kg. Considering the global per capita fish requirement of 12 kg and assuming India's fish eating population by 2005 A.D to be around 670 million the estimated requirement of fish is around 7.8 mmt. It is in this context that efforts are being made to augment the fish production from different sector, marine-capture, mariculture, inland - capture of freshwater aquaculture sectors, in the country.

Freshwater aquaculture practices are highly eco-sustainable, being comparative with other farming activities. If the requisite intensification of practices as also utilization

of organic wastes of wastewaters are provided the aquaculture scene is in for a boom. With traditional aquaculture oriented states like West Bengal, Kerala making a mark, there has been a spurt in the aquaculture activities in the country as seen in the states of Andhra Pradesh, Punjab, Haryana, Pondicherry, Maharashtra and so on. With the resources and technologies available, great emphasis is being laid on technology transfer to achieve 'Blue Revolution' in the fishery sector, with production potentials as high as 4.5 mmt.

Indian fisheries are an important component of the global fisheries, with India being the 3<sup>rd</sup> largest producer of fish. India's contribution to global fish production has increased from 3.26% in 1985 to 4.34% in 1995. Compared to growth in world fish production, fish production in India has increased at a faster rate mainly due to increasing inland fish production. In 1995, India accounted for 10.47% of world inland fish production and 2.94% of marine fish production.

**Table 5 : India vis-à-vis World in Fish Production ( million tones )**

	1985	1990	1995
World			
Marine	75.80 (87.60)	83.25 (83.25)	91.90 (81.39)
Inland	10.73 (12.40)	12.40 (15.03)	14.72 (18.61)
Total	86.53	97.97	112.91
India			
Marine	1.73 (61.35)	2.22 (58.58)	2.70 (54.99)
Inland	1.09 (38.65)	1.57 (41.42)	2.20(44.81)
Total	2.82	3.79	4.90
India's share			
Marine	2.28	2.67	2.94
Inland	10.16	10.67	10.47
Total	3.26	3.87	4.34

Playing an important role in World Fisheries of aquaculture scenario, India produces over 2.44 mmt from the inland fisheries sector being in the second position in the world. Indian fisheries has rich resources of 171334 km of rivers of canals, 2.05 m ha of reservoirs, 2.36 m ha of ponds of tanks, 1.07 m ha of bheels, oxbow lakes of derelict water of 1.42 m ha of brackish water area.

Fish production in India made rapid strides from 7.52 lakh tonnes in 1950-51 to 52-62 lakh tonnes in 1998-99, thus indicating a 699% rise in the production level during the period Marine sector remained the major contributor till 1990-91. Its contribution to total fish production by 1960-61 was over 70% but it declined drastically to 51.24% in

1990-91. The changes are attributed to the drastic increase in inland fish production reaching up to a staggering 48.76% in 1998-99. Further, it is significant that the aquaculture production has increased by 3 fold in a decade's time from 511000 tonnes to 1609000 tonnes in the recent times. Recently the percentage share of aquaculture in total inland production has shown a steep rise from 46% to 72%. Two specific aqua-produce, carps in freshwater aquaculture of shrimps in brackish water aquaculture, have contributed to the bulk as well as value of the inland aquaculture sector. Also the changes were due to deceleration in growth of marine fish production and a policy shift in favour of inland fisheries, particularly aquaculture.

### **Aquaculture : A 'Blue Print for Growth'**

To meet the food security of nutritional requirements of the burgeoning population in the country, the potentials of the fisheries sector, in particular of freshwater aquaculture with regard to their contribution to the country's food basket needs to be tapped and utilised. Several strategies are being planned for increasing fish production in the nation. Intensification and upgradation of existing practices, is spare required diversification of culture systems, recycling of abundant organic material, comprehensive environmental management, development of genetically superior fish breeds, provision of balanced feeds, systematic measures to control outbreak of fish diseases, development of infrastructure for culture of post-harvest operations, greater emphasis on human resource development of extension, community aquaculture and financing are some of the strategies to be developed in this context. Thus, the amalgamation of various disciplines will forge and hold a bright future for aquaculture in India.

Some of the salient features which needs to be implemented for increasing fish production from freshwater aquaculture sector are discussed below :

1. The country posses an estimated 2.36 million ha of ponds of tanks available for fish culture. However, these are severely under-utilised. Only about 16% of the freshwater area of 10% of the brackish water area has been utilised for fish farming. It is projected that if about 1.5 million ha are brought under culture operations. Further, considering the present national average pond production of fish of 2.27/ha/yr in the proposed 1.5 million ha area of ponds itself could double the fish production from freshwater aquaculture sector. Necessary support in terms of pond preparation, seed production, fertilizer of feed management are to be planned for enabling increase area coverage as proposed above.
2. India has a huge untapped potential Common Property Resources (CPR) are available for aquaculture. These are in the form of temple tanks, village ponds, derelict waters, etc. People must be persuaded to do community fish farming in such underutilized water resources. Co-operatives can be set up to streamline the efforts in this direction.

3. Considering the prevalent production levels in ponds of tanks in the country, with due reference to the agro-ecological conditions, fish species, technology adoption levels, demand patterns, export potentials of predicted growth in freshwater aquaculture sector in different states, a strategic plan for increasing fish production from freshwater aquaculture, Operation Aqua-Gold (Matsyavardhan) is proposed. On implementation over a time frame of 5 - year plan, Operation Aqua gold would double fish production to 3.31 mmt from freshwater aquaculture sector.

1. Country	:	India
2. Water area available under ponds and tanks (ha)	:	2358634
3. Present annual inland fish production (t)	:	2242170
4. Present annual freshwater aquaculture fish production	:	1512000
5. Proposed area to be brought under fish culture (ha)	:	1199500
6. Projected annual freshwater aquaculture fish production (t)	:	3312800
7. Projected mean productivity (t/ha/yr)	:	2.762
8. Present and projected production		

	Present	Projected
a) Total estimated area under freshwater aquaculture (ha)	826230	1199500
b) Total fish production from freshwater Aquaculture (t)	1512000	3132800
c) Productivity (kg/ha/yr)	1830	2762

9. Strategic requirements of Operation Aqua-Gold ( Matsyavardhan )

a) Required increase in area average	:	373270 ha; 45.18%
b) Required increase in pond productivity	:	:932 kg/ha/yr; 50.9%
c) Seed requirement (million)		
1) Spawn	:	45000
2) Fry	:	15000
3) Fingerlings	:	7500
d) Requirement of pond area		
1) Area for brood stock management (@2t/ha):		450 ha
2) Nursery area (@10 million/ha)	:	4500 ha
3) Rearing area (@0.2 million/ha)	:	75000ha

**Aquaculture : an option for Food Security**

Thus, we have seen that the huge untapped aquaculture field shows a great promise for meeting the food security of the country. The following reasons in brief can be attributed to this :

1. Agriculture potential is limited, due to limited land area available, over saturation, reduction in ground water level, loss of fertility, etc. calls for an alternative source of food.
2. Other livestock food products in comparison to fishery products are expensive and also not preferred due to religious customs, etc.
3. Capture fishery potential is limited. Marine capture fisheries have almost become stagnant owing to over-exploitation and uncontrolled catching.
4. The vast water resources of the country available for aquaculture whose productivity can be enhanced, culturing wide varieties of fin fishes, shellfishes of sea weeds as food.
5. Nutritional value of fish causes more demand. Fish compared to other product is the cheapest source of quality protein, vitamins, minerals, unsaturated fatty acids which are helpful in controlling heart disease and other ailments. It is also tastier.

Other factors, which has led to the boom in the aquaculture production are :

1. Increased population growth.
2. Rate of urbanisation of modernisation.
3. Growth in per capita income.
4. Changes in consumption behaviour.
5. Livestock feed requirements.
6. Protein deficit in the country.

### **Conclusion :**

India being a country having a vast expansion of natural water bodies of freshwater, brackish water and marine resources can be utilised for fish production. It has a great potential for contributing to the food security of self reliance for food. Both the horizontal and vertical expansion in aquaculture using the natural water resources available for fish farming will go a long way for achieving a great impact towards sustainable food production in the country. Almost 70% of the earth's surface is covered by water and the optimum utilisation of this huge resource for fisheries will produce even more food that what is required by the people of the whole world.