CHAPTER-4

FISHCULTURE AS A MEANS OF EMPLOYMENT AND INCOME IN ASSAM

4.1 INTRODUCTION:

The state, which provides shelter to 2.58 per cent (3.12 crores) population of India according to 2011 Census Report, Assam, has been suffering from various socio-economic problems. One of the serious economic problems is unemployment, especially rural unemployment. It is due to the slow pace of economic development caused by slow industrial and agricultural growth. The economy of Assam is basically agro-based along with plantation. Agriculture sector provides employment to more than 50 percent of the state workforce supporting more than 75 percent population directly or indirectly (*Economic Survey of Assam*, 2015). The rate unemployment in Assam was 61 and 55 per 1000 in total and rural respectively in 2015-16 and this was higher than national average 50 and 51 respectively. Per capita income of Assam was four percent higher than that of national average at the time of independence. However, at present, it is lower than that of national average and the gap has been widening after enforcement of new economic policy reforms, 1991. The state is one of the poorest states in India with around 37.00 percent population as a whole living under poverty line and with 40.5 percent rural poverty in 2013-14[1]. So, it is necessary to have alternative avenues that can immediately provide some viable avenues for employment to the increasing unemployed labour force. Here lies the importance of fishculture which is mostly labour intensive in nature. Moreover, Assam experiences the predominant influence of the south west tropical monsoon and this monsoon is normally active from April to October of the year with occasional winter showers. The annual average rainfall of the state has the variation between 1600 mm and 4300 mm from place to place. The average rainfall for the state as a whole is about 2900 mm with its maximum during the months of June and July.

[1]Government of Assam, (2014), *Assam Human Development Report, 2014*.

Assam has been often affected recurrent flood and agriculture is washed away. Fishculture has to play the vital role as an antidotes to the problem of unemployment and reduction in poverty and a source of nutrition to the poor Assamese people for a long period of time.

Here, in this chapter, the role of fishculture in the generation of employment in India and Assam and spatio-temporal variation of it has been analysed. First of all, production of fish (i.e. supply side) from macro to micro level has been presented. Here, fish production in the world both in marine and inland has been discussed with the inclusion of the relative ranks of top marine and inland fish producing countries. It is followed by a discussion on overtime production of inland and marine fish in India as well as across the states and Union Territories (UTs). Next, there is a presentation of production of seed fish across the states and UTs in 2014-15 in a tabular form. Overtime changes in contribution of fishculture to Gross Domestic Product (GDP) at current prices of India has been analysed. Later, contribution of fishery to NSDP at current prices of Assam has been engrossed. Region-wise employment in fishery sector in the globe from 2000 to 2004 has been highlighted. It is followed by a discussion on the contribution of fishculture in the generation of employment in the nation and across the states and UTs and also in the state of Assam. Lastly, overtime export and import of fish from India as well as the state of Assam has been discussed.

For analytical purposes, fish production in the globe both marine and inland, percentage contribution of top fish producing countries to globe fish production, production of fish both inland and marine in the nation and across the states and UTs, number of male and female engaged in fishculture and its related activities as part time and full time occupation job in the nation and across the states and UTs and in Assam, contribution of fish-culture to GDP at current prices of the nation and of Assam etc. have been collected from Food and Agriculture Organisation (FAO), various live stock Census, Department of Animal Husbandry and Dairying, Ministry of Agriculture, Government of India, Central Statistical Organisation and other official reports.

4.2. FISH PRODUCTION IN THE WORLD:

World fish production has been increasing with the increase in both of inland and marine fish production overtime. World fish production which was 1,30,434 thousand tonnes in the year 2000 increased to 1,44,599 thousand tonnes in 2009 and then to 169.2 million metric tonnes in 2015. In table-4.1, top 12 fish producing countries have been presented. China is the major fish producing country as it contributed 31.87 percent of world fish production in 2000 and has been successful in holding topmost position among all the countries (Table-4.2). Its contribution to world fish production has increased to 46.92 percent in 2015. Peru and Japan which occupy 2nd and 3rd position in the year 2000 have lost their position due to decreased in production. Peru and Japan slipped to 7th and 8th positions respectively in the year 2015. Prawn, blue crab, fin inland fish, red sea bream, and shellinland fish are included in the major products of Japan. In USA also, one can see a decline in production. It is because of the fact that these countries depend mostly on marine than on inland fishculture. With increase in pressure over capture fish, diseconomies of scale started to operate. India, ranked the 4th position in the year 2000 with 5,689 thousand tonnes of production of fish had climbed to 3rd position in 2005 surpassing Japan and then reached the 2nd position since 2009 surpassing Peru and again fell to 3rd position in 2015. Production of fish has been increasing in India with the increase in inland fish production over the years. Indonesia has been improving its position in the picture of world fish production and was able to hold 2nd position in 2015. However, the gap between 1st and 2nd is not marginal; rather massive. Vietnam, which was in 10th rank in the production of fish jumped up to 5th rank with increase in production by more than double during 2000 to 2009. Percentage contribution has also been more than double from 1.50 percent in 2000 to 3.67 per cent in 2015 as noticed from table-4.2. It is due to increase of inland fish production in Vietnam. Catindland inland fish and giant tiger prawn culture are the two main crops produced in Vietnam.

Table-4.2, reveals that China's contribution to globe fish production is more than sum total contribution of nine top fish producing countries. The

gap between top China and 2nd either Peru or India or Indonesia has been widening over the years.

Table-4.1
Top Twelve Fish Producing Countries (in '000 tonnes)

Country	2000	2005	2009	2015
China	41568 (1)	49468 (1)	49699 (1)	79.39 (1)
Peru	10658 (2)	9417 (2)	6959 (3)	4.93 (7)
Japan	5752 (3)	4819 (7)	4634 (7)	4.66 (8)
USA	5173 (5)	5361 (5)	4702 (6)	5.47 (6)
India	5689 (4)	6319 (3)	7845 (2)	10.1 (3)
Indonesia	4928 (6)	5578 (4)	6833 (4)	22.21 (2)
Chile	4692 (7)	5029 (6)	4247 (8)	3.19 (14)
Russian Fed	4048 (8)	3306 (10)	3943 (9)	4.62 (9)
Thailand	3630 (9)	3743 (8)	3138 (12)	N.A.
Vietnam	2280 (10)	3367 (9)	4799 (5)	6.21 (5)
Myanmar	NA	NA	3545 (10)	2.95 (15)
World	**130434**	**142691**	**144599**	**169.2***

Source: Food and Agriculture Organisation (FAO)
Notes: (1) Figures in the parentheses represent Rank of the country in the respective year.
(2) NA means Not Available.
(3)* World production of fish is in Million Metric tonnes.

Table-4.2
Percentage Share of Major Ten Fish Producing Countries in World Fish Production

Country	2000	2005	2009	2015
China	31.87	34.67	34.37	46.92
Peru	8.17	6.60	4.81	2.92
Japan	4.41	3.38	3.20	2.75
USA	3.97	3.76	3.25	3.23
India	4.36	4.43	5.43	5.97
Indonesia	3.78	3.91	4.73	13.12
Chile	3.60	3.52	2.94	1.88
Thailand	2.78	2.62	2.17	NA
Philippines	1.75	1.97	2.31	NA
Vietnam	1.50	2.36	3.32	3.67
Myanmar	NA	NA	2.45	1.74

Source: Food and Agriculture Organisation (F.A.O.)
Note: (1) NA means Not Available.

From table-4.3 and 4.4, it is revealed that China has been able to occupy top most position in both inland and marine fish production. Lion's share of the inland fish production in the world during 1995 to 2014 has been produced by China, India, Indonesia, Vietnam, Thailand and Bangladesh.

Production of inland fish which was 10,836 thousand tonnes in 1995 had reached 26,029 thousand tonnes in 2014 which was around two and half times. India has been successful in holding 2nd position in inland fish production during 1995 to 2014 with continuous rise in the production of its inland fish. It may be attributed to both intensive and extensive expansion of fishculture in China and India. Indonesia which occupied 3rd position in 1995 was able to occupy the same position in 2014 also. Nearly, one third of Indonesia's fish farming has been integrated with paddy cultivation. Seaweed, shellindland inland fish, shrimp, green grouper, and high value inland fish have made aquaculture sustainable in Indonesia. Similarly, Vietnam is holding the 3rd rank in 2014 with increase in production by more than six times during the same period of time. Nile Tilapia, hybrid catindland inland fish, giant river prawn are some of the important inland fish farmed in Thailand. Recently, shrimp culture also leads aquaculture in Bangladesh.

As show in table-4.4, China, Peru, Japan, Chile, USA and Indonesia are the major top marine fish producing countries in the world. China has been able to hold 1st position during 1995 to 2014 in spite of fall in production from 17582 thousand tons in 1995 to 14811 thousand tons in 2014. It should, however, be noted that China was much ahead of Peru or Indonesia in the marine fish production. As like China, production of marine fish in other top four countries viz. Peru, Japan, USA and Chile also decreased. However, in Indonesia, it increased from 3487 thousand tonnes to 6016 thousand tonnes during the same period from 1995 to 2014.

Table-4.3
Top Six Inland Fish Producing Countries (in '000 tonnes)

Country	1995	2000	2005	2009	2014
China	10836 (1)	16820 (1)	19592 (1)	25357(1)	26029 (1)
India	2197 (2)	2838 (2)	3663 (2)	4560 (2)	4391 (2)
Indonesia	660 (3)	734 (3)	1208 (3)	2031 (5)	2857 (3)
Vietnam	391 (4)	542 (4)	1105 (4)	2529 (3)	2478 (4)
Thailand	380 (5)	471 (5)	738 (5)	1305 (7)	401 (9)
Bangladesh	NA	NA	NA	2283 (4)	1733 (5)

Source: Food and Agriculture Organisation (FAO)
Notes: (1) Figures in the parentheses represent Rank of the country in the respective year.
(2) NA means Not Available.

Table-4.4
Top Six Marine Fish Producing Countries (in '000 tonnes)

Country	1995	2000	2005	2009	2014
China	17582(1)	24748(1)	32874(1)	24342 (1)	14811 (1)
Peru	8886 (2)	10625(2)	9373(2)	6885 (2)	3548 (6)
Japan	6679 (4)	5669(3)	5654(3)	4552 (4)	3630 (5)
Chile	7591 (3)	4692 (5)	5442 (5)	4218 (6)	2175 (11)
USA	5382 (5)	4863 (4)	5694 (6)	4378 (5)	4954 (3)
Indonesia	3487 (7)	4195 (6)	5633 (4)	4802 (3)	6016 (2)

Source: Food and Agriculture Organisation (FAO)
Note: Figures in the parentheses represent Rank of the country in the respective year.

4.3. FISHCULTURE IN INDIA:

India is rich in water resources in respect of both in inland as well as marine. In respect of marine water resources, it has a part of Arabian Sea in the West, Bay of Bengal in the East and Indian Ocean in the South. In respect of inland water, it has big river like the Brahmaputra, Ganga, Yamuna, Godavari, Krishna, Cauveri, etc. India is also enriched with water reservoirs, tanks & ponds, flood plain lakes/derelict waters, brackish water, etc.. India has the total inland water bodies covering an area of 73.59 hectares as depicted in table- 4.5 below.

Table-4.5
Indian Fishery Resources at a Glance

Marine	
Length of coast line (Km)	8,118
Exclusive Economic Zone (EEZ) million Sq Km	2.02
Continental Shelf ('000 sq km)	530
Inland	
Total inland water bodies (lakh Ha)	73.59
Rivers & canals (Km)	195210
Reservoirs (Lakh ha)	29.07
Tanks & ponds (lakh Ha)	24.14
Flood plain lakes/derelict waters (lakh Ha)	7.98
Brackish water (lakh Ha)	12.40

Source: *Handbook on Fisheries Statistics 2011*

With these ample water resources, India had produced 7.52 lakh tonnes of fish in 1950-51 which increased to 100.69 lakh tonnes of fish in 2014-15 (Table-1.2, Chapter-I). It is reflected in table-4.6 that average annual growth rate of fish production in India was the highest during 1950-55 with

7.71 percent and the lowest during 1970-75 with 0.31 percent. In respect of marine fish production in India, average annual growth rate was the highest during 1955-60 with 8.11 percent and the lowest during 1960-65 with negative growth rate of -1.31 percent. During this negative growth of marine fish production for the years 1960-65, India's average annual growth rate of inland fish production had reached the highest with 12.45 percent. However, the lowest average annual growth rate of India's inland fish production was received at 2.57 percent during the period 1975-80. For the rest of the world, average annual growth rate of fish production reached the highest during 1955-60 with 6.73 percent while fell to the lowest during 1975-80 with 1.53 percent. For marine fish production, the highest average annual growth rate for the rest of the world was achieved during the period 1950-55 with 7.34 percent while negative growth rate was received at -1.76 percent during the period 2005-09. In opposite of it, the highest average annual growth rate of inland fish production for the rest of the world was reached during the period 1950-55 with 10.46 percent and the lowest growth rate was received at 1.85 percent during the period 1955-60.

Table-4.6
Average Annual Growth Rate in Fish Production

Period	Total	Rest of the World			India	
		Marine	Inland	Total	Marine	Inland
1950-55	7.71	7.34	10.46	2.82	2.77	2.96
1955-60	5.08	5.52	1.85	6.73	8.11	3.02
1960-65	6.90	7.15	4.79	2.75	-1.31	12.45
1965-70	5.60	5.84	3.36	5.73	5.68	5.83
1970-75	0.31	0.07	2.70	5.21	6.42	3.13
1975-80	2.04	2.02	2.16	1.53	0.97	2.57
1980-85	3.91	3.55	6.92	3.02	2.36	4.15
1985-90	1.19	0.76	4.13	6.08	5.36	7.18
1990-95	4.35	3.27	10.41	5.21	3.65	7.42
1995-2000	2.36	1.24	7.23	2.86	0.78	5.27
2000-05	1.83	0.32	6.68	3.23	1.04	5.45
2005-09	0.35	-1.76	5.35	4.36	2.45	5.88
2009-2014*	**4.78**	**NA**	**NA**	**NA**	**2.71**	**6.03**

Source: *Handbook of Fisheries Statistics 2011*
Note: NA means Not Available.

4.4. PRODUCTION OF FISH AND SEED FISH ACROSS THE STATES/UTS OF INDIA:

Fish is not uniformly produced across the states/UTs of India. In 2014-15, total production of fish in India was 100.72 lakh tonnes comprised of marine fish production 34.91 lakh tonnes and inland fish production 65.81 lakh tonnes. If we take all the states and Union Territories (UTs) of India, marine water is shared by 13 states only. It is depicted in Table-4.7 that among all the states and UTs of India, the largest amount of marine fish is produced by Gujrat amounting to 6.98 lakh tonnes followed by Andhra Pradesh with 4.75 lakh tonnes and Kerala with 4.72 lakh tonnes in 2014-15. In the same year 2014-15, Lakshadweep was the least producer of marine fish in India amounting 13.2 thousand tonnes while ahead of Lakshadweep was Daman & Diu with 28.7 thousand tonnes and Andaman & Nicobar Island with 36.9 thousand tonnes.

In the production of inland fish, Andhra Pradesh topped the list among all the states and UTs in India with 14.89 lakh tonnes in 2014-15 followed by West Bengal with 14.38 lakh tonnes and Uttar Pradesh with 4.94 lakh tonnes in 2014-15. Assam was in the rank of 7^{th} position in respect of the production of inland fish in India for the year 2014-15. A few states like Dadra & Nagar Haveli, Daman & Diu and Lakshadweep held there position as zero inland fish producer in 2014-15.

In the production of fish as a whole, Andhra Pradesh ranked the topper with 19.64 lakh tonnes followed by West Bengal with16.17 lakh tonnes and Gujrat with 80.99 lakh tonnes in 2014-15. Assam was in 12^{th} position among all the states and UTs with 2.82 lakh tonnes of production in the year 2014-15. In respect of total fish production also, production of fish was nil in Dadra & Nagar Haveli for the same year 2014-15.

Considering seed fish production, it is observed from table-4.8, it is observed that West Bengal ranks the first position in the production of seed fish among all the states and UTs with 16717 million fry in 2014-15 followed by Andhra Pradesh with 6718 million fry and then Odisha with 5557 million fry. Rank of Assam was 4^{th} among all the states and UTs in 2014-15. There

were five states and UTs having production fish as nil, namely, Kerala, Dadra & Nagar Haveli, Daman & Diu, Lakshadweep and Puducherry.

Table-4.7
Fish Production during 2014-15 (Provisional)

(in Tonnes)

States/UTs	Marine	Inland	Total
Andhra Pradesh	475401	1489033	1964434
Arunachal Pradesh	0	4000	4000
Assam	0	282700	282700
Bihar	0	479800	479800
Chhattisgarh	0	314164	314164
Goa	114571	3276	117847
Gujarat	698450	111482	809932
Haryana	0	111203	111203
Himachal Pradesh	0	10736	10736
Jammu and Kashmir	0	20300	20300
Jharkhand	0	106430	106430
Karnataka	389822	223419	613241
Kerala	472744	159512	632256
Madhya Pradesh	0	109121	109121
Maharashtra	423794	124952	548746
Manipur	0	30500	30500
Meghalaya	0	5893	5893
Mizoram	0	6387	6387
Nagaland	0	7835	7835
Odisha	133211	306645	439856
Punjab	0	114770	114770
Rajasthan	0	46314	46314
Sikkim	0	440	440
Tamil Nadu	457454	240158	697612
Telangana	0	265379	265379
Tripura	0	63560	63560
Uttarakhand	0	3936	3936
Uttar Pradesh	0	494265	494265
West Bengal	178851	1438468	1617319
A & N Island	36980	197	37177
Chandigarh	0	118	118
Dadra & Nagar Haveli	0	0	0
Daman & Diu	28772	0	28772
Delhi	0	675	675
Lakshadweep	13186	0	13186
Puducherry	68053	5452	73505
All India	**3491290**	**6581121**	**10072411**

Source: Fisheries Division, D/O Animal Husbandry, Dairying & Fisheries

Table-4.8
Top to Bottom Seed Fish Producing States during 2014-15 (Provisional)

States/UTs	**Production in Million Fry**
West Bengal	16717
Andhra Pradesh	6718.98
Odisha	5557.63
Assam	4585
Uttar Pradesh	1661.54
Chhattisgarh	1351.42
Jharkhand	1108.46
Madhya Pradesh	1001.88
Rajasthan	826.26
Tripura	736.75
Haryana	639.06
Karnataka	529.96
Bihar	505.74
Tamil Nadu	263.58
Gujarat	248.4
Punjab	229.74
Manipur	170
Maharashtra	143.71
Meghalaya	58.43
Uttarakhand	48.57
Nagaland	47.7
Jammu and Kashmir	40.05
Mizoram	30
Himachal Pradesh	25.7
Arunachal Pradesh	9.84
Telangana	3.3
Sikkim	2.95
Delhi	1.67
Goa	1.4
A & N Island	1.21
Chandigarh	0.8
Kerala	0
Dadra & Nagar Haveli	0
Daman & Diu	0
Lakshadweep	0
Puducherry	0
All India	**43.266.73**

Source: Fisheries Division, D/O Animal Husbandry, Dairying & Fisheries

4.5. **CONTRIBUTION OF FISHERIES TO GDP AT CURRENT PRICES OF INDIA:**

In India, GDP at current prices got an increase from Rs.39,708/ crores in 1970-71 to Rs. 1,04,77,140/ crores in 2013-14 while contributing value of fishery increased from Rs.245 crores in 1970-71 to Rs. 96,824 crores in 2013-14 (Table-4.9). Thus, fishery sector of India has been contributing a significant amount to GDP for a long time. Though there is a remarkable fall of the share of agriculture to GDP of India since 1970-71, the contribution of fisheries to GDP at current prices has been going to rise. The share of fishery sector to GDP at current prices of India had got an increase from 0.62 percent in 1970-71 to its highest level at 1.18 in 2000-01 and decreased to 0.92 percent in 2013-14. It might be attributed to both increase in production of especially inland fish in the one hand and prices of fish on the other. During the same period of time, the share of fishery sector to the GDP from agriculture had got an increase significantly from 1.46 percent in 1970-71 to 5.58 percent in 2013-14. It was due to the fact that growth of fishery sector was more rapid than the growth of other sectors of agriculture like food grains, milk, eggs and many other food items in one hand and rise in prices of fish on the other.

From Table-4.10, it is observed that whole sale inland fish price index considering 1993-94=100 has got an increase more than triple times from 127.30 in 1996 to 389.70 in 2009 while whole sale price index of marine fish has increased slightly higher than double from 143.30 in 1996 to 298.90 in 2009. It is nothing but the reflection that whole sale price index of inland fish increased more than marine fish during 1996 to 2009 based on 1993-94 as base year. Initially during 1996 to 1997, although whole sale price index of marine fish was greater than that of inland fish, it was passed on in the successive years. The reason behind it may be lower demand for Indian marine fish both in national and international market in comparison to inland fish.

Table-4.9
Contribution of Fisheries Sector to GDP at Current Prices of India during 1970-71 to 2013-14 (Rs in crore)

Year	Total GDP	GDP from		GDP from fisheries as % of	
		Agriculture	Fisheries	Total GDP	GDP from Agriculture
1970-71	39708	16821	245	0.62	1.46
1975-76	71201	26651	567	0.80	2.13
1980-81	122427	42466	921	0.75	2.17
1985-86	233799	69964	1974	0.84	2.82
1990-91	475604	135162	4556	0.96	3.37
1995-96	1103238	312791	12729	1.15	4.07
2000-01	1902998	423522	22535	1.18	5.32
2005-06	3390503	637772	31699	0.93	4.97
2006-07	3953276	722984	35182	0.89	4.87
2007-08	4582086	836518	38931	0.85	4.65
2008-09	5303567	943204	44073	0.83	4.67
2009-10	6108903	1083514	50370	0.82	4.65
2010-11	7266967	1306942	57369	0.79	4.39
2011-12	8353495	1465753	65541	0.78	4.47
2012-13	9252051	1668676	78053	0.83	4.75
2013-14	10477140	1881152	96824	0.92	5.58

Source: Central Statistical Organisation, Government of India

On the contrary, considering 2004-05 as base year whole sale price index of marine fish got an increase at a higher rate than inland fish during 2005-2011. Considering 2004-05 as base year, whole sale price index of inland fish has increased more than double from 113.70 in 2005 to 291.4 in 2017 while whole sale price index of marine fish got an increase from 98.40 to 236.60 during 2005 to 2011.

Table-4.10 Indices of Whole Sale Prices of Fish

Year	**Inland Fish**	**Marine Fish**
Base 1993-94=100		
1996	127.30	143.30
1997	150.80	186.60
1998	166.70	201.70
1999	182.30	186.50
2000	237.00	192.90
2001	245.70	193.60
2002	291.50	180.80
2003	258.40	206.50
2004	265.00	202.20
2005	318.30	202.30
2006	332.30	233.40
2007	299.40	274.50
2008	289.90	300.30

2009	389.70	298.90
Base Year 2004-05=100		
2005	113.70	98.40
2006	112.50	118.60
2007	101.90	125.20
2008	101.00	139.20
2009	135.50	151.40
2010	186.70	212.80
2011	230.60	236.60
2012	291.4	NA
2013	365.2	NA
2014	380.0	NA
2015	367.5	NA
2016	414.8	NA
2017	291.4	NA

Source: Office of Economic Advisor, Ministry of Commerce and Industry, Govt of India.

4.6. CONTRIBUTION OF FISHERIES TO NSDP AT CURRENT PRICES OF ASSAM:

The NSDP of Assam at factor cost by industry of origin at current prices had got an increase from Rs.4,71,8075 lakh in 2004-05 to Rs. 1,75,21,000 lakh in 2014-15 which means that it had increased by nearly four times while at constant price of 2004-05, it got an increase from Rs. 4,71,8075 lakh in 2004-05 to Rs. 7,37,7923 lakh in 2013-14 which is even less than two times. It reflects that price rise is very high in the state of Assam for which NSDP at current prices is around double of NSDP at constant prices. Contribution of fishery sector to NSDP at current prices got an increase from Rs. 69,139 Lakh in 2004-05 to Rs. 5,50,751 lakh in 2014-15. In terms of percentage to NSDP, its contribution also got an increase from 1.46 percent in 2004-05 to 3.14 percent in 2014-15. In absolute terms, it had got an increase by nearly eight times while in percentage to NSDP, the increase will be of two times. However, at constant prices of 2004-05, contribution got an increase from Rs. 69,139 lakh to Rs. 94,383 lakh in 2013-14 and in percentage terms, it decreased from 1.46 per cent in 2004-05 to 1.28 per cent in 2013-14. Although the contribution of primary sector to NSDP both at current prices and constant prices of 2004-05 got a decrease from 35.04 in 2004-05 to 28.72 percent and 25.98 percent in 2013-14 respectively, percentage contribution of fishing to primary sector at current

prices and constant prices had got an increase from 4.18 percent in 2004-05 to 6.91 percent and 4.93 percent in 2013-14 respectively. It may be attributed to higher growth rate of fish and its price level than other sectors of the economy of the state (Table-4.11).

Table-4.11 NSDP at Factor Cost by Industry of Origin, Assam (at 2004-05 price) (Rs in Lakh)

Year	At Current Price	At Constant Price	Fishing at Current Price	Fishing at Constant Price	Primary Sector at Current Price	Primary Sector at Constant Price	% of Fishing to Primary Sector at Current Price	% of Fishing to Primary Sector at Constant Price
2004-05	4718075	4718075	69139 (1.46)	69139 (1.46)	1653028 (35.04)	1653028 (35.04)	4.18	4.18
2005-06	5243969	4860162	101172 (1.93)	70634 (1.45)	1969407 (37.56)	1676133 (34.49)	5.14	4.22
2006-07	5703346	5079653	128583 (2.25)	65438 (1.28)	1993497 (34.95)	1702660 (33.52)	6.45	3.84
2007-08	6234163	5296798	128814 (2.07)	63561 (1.20)	2138656 (34.31)	1765899 (33.34)	6.03	3.59
2008-09	7147811	5612296	136827 (1.91)	69321 (1.24)	2400363 (33.58)	1716439 (30.58)	5.70	4.04
2009-10	8525310	6129390	156525 (1.84)	79891 (1.30)	2844214 (33.36)	1795999 (29.30)	5.51	4.44
2010-11	10062671	6572602	202084 (2.01)	73644 (1.12)	3252687 (32.32)	1813230 (27.59)	6.22	4.06
2011-12	11183282	6694188	222245 (1.99)	75509 (1.13)	3472052 (31.05)	1865089 (27.86)	6.40	4.45
2012-13	12137973	6941707	265472 (2.19)	93880 (1.35)	3598998 (29.65)	1893535 (27.28)	7.37	4.96
2013-14	13960400	7377923	276686 (1.98)	94383 (1.28)	4009051 (28.72)	1916733 (25.98)	6.91	4.93
2014-15	17521000		550751 (3.14)					

Source: Statistical Handbook, Govt. of Assam, various issue.
Note: Figures in the parentheses represent percentage to NSDP

4.7. EMPLOYMENT IN FISHERIES SECTOR IN THE WORLD:

As per FAO 2016 report, 56.6 million people got employment in capture fisheries and aquaculture in 2014 out of which 36 percent were employed as full time, 23 percent as part time and the remaining were either as occasional fishers or as of unspecified status. Distribution of fishermen

region wise during 2000 to 2014 is depicted in Table-4.12. In 2014, out of world population employed in fisheries and aquaculture, 84 percent belonged to Asia; 10 percent belonged to Africa and Latin America and 4 (Four) percent were Caribbean. Asia dominates among the fish farmers. The share of Oceania, North America, Europe, Africa and Latin America and the Caribbean were insignificant. Out of 18 million fisherman of the world, 94 percent belonged to Asia. It revels that all the other regions contributed only 6 percent to the family of world fishermen.

Women accounted for 19 percent of the total of them who directly engaged in the primary sector in 2014. But their share got an increase to half of the workforce with the inclusion of the secondary sector (e.g. processing, trading) in it (*The State of World Fisheries and Aquaculture 2016,* P-12).

Table-4.12
World Fishermen and Fish Farmers by Region during 2000 to 2014
('000)

Region/Year	**2000**	**2005**	**2010**	**2014**
Africa	4175	4430	5027	5674
Asia	39646	43926	49345	47730
Europe	779	705	662	413
Latin America and the Caribbean	1774	1907	2185	2444
North America	346	329	324	325
Oceania	126	122	124	46
World	**46845**	**51418**	**57667**	**56632**
Of which Fish Farmers				
Africa	91	140	231	284
Asia	12211	14630	17915	18032
Europe	103	91	102	66
Latin America and the Caribbean	214	239	248	356
North America	6	10	9	9
Oceania	5	5	5	6
World	**12632**	**15115**	**18512**	**18753**

Source: *The States of World Fisheries and Aquaculture 2016*, FAO

4.8. EMPLOYMENT IN FISHERIES SECTOR IN INDIA:

Fishery sector provides employment to the people of different types in the society at various levels. Male, female and even children have also got engaged in different activities of fishery like marketing, repairing of nets, processing of fish, etc. Total number of family members in India getting

engaged in this occupation for the years 1992 and 2003 are presented in table-4.13.

Table-4.13 Number of Family Members Engaged in Fishing Occupation in India in 1992 & 2003 (in Hundreds)

Year	Location	Male	Female	Children	Total
1992	Rural	21181 (35.71)	17479 (29.46)	20669 (34.84)	59330
	Urban	2680 (33.62)	2321 (29.11)	2973 (37.29)	7973
	Total	23861 (35.44)	19800 (29.42)	23642 (35.13)	67303
2003	Rural	42838 (32.24)	36870 (27.75)	53159 (40.01)	132867
	Urban	4123 (34.39)	3470 (28.95)	4393 (36.65)	11986
	Total	46962 (32.42)	40340 (27.85)	57552 (39.73)	144854

Sources: (1)15th Indian Livestock Census 1992, Vol-1, Directorate of Economics and Statistics, Department of Agriculture and Co-operation, Ministry of Agriculture, Government of India.

(2): Department of Animal Husbandry and Dairying, Ministry of Agriculture, Government of India.

Note: The figures in the parenthesis represent percentage to the total.

From table-4.13, it is seen that total number of family members engaged in fishing occupation was 67, 30, 300 in the year 1992 which got an increase up to 1, 44, 85, 400 in the year 2003. It means that the growth was more than double within the period. When we take the year 1992, we have seen that out of total fishermen, share of male was the highest with 35.44 percent, followed by children and female with 35.13 per cent and 29.42 percent respectively. In the same year, however, there was a wide variation in the distribution of fishermen between rural and urban. The share of rural fishermen to total fishermen was 88.15 percent as against 11.65 percent of urban areas. It was due to the fact that fishculture was rural oriented and the fishermen inhabited in the rural areas. In the year 2003, the share of male and female decreased to 32.42 percent and 27.85 per cent respectively, as against the increase of children up to 39.73 percent. In the same way, the gap between the distribution of fishermen between rural and urban areas had also widened. The share of rural fishermen had increased up to 91.73 percent in 2003 as against the decrease of the share of urban fishermen to 8.27 percent.

4.9. STATE-WISE DISTRIBUTION OF FISHERMEN POPULATION IN INDIA:

The fisherman population is not uniformly distributed among the states and Union Territories (UTs) of India. Total number of population engaged in fishculture in India was 57,17, 760 in 1993 out of which 20,45,705 was full timer, 16,09,220 was part timer and 20,62,835 took it as occasional job (Table-4.14). Total number of fisherman population decreased to 59,59,144 in 1994 out of which 23,94,574 was full timer and 14,43,223 was part timer and 21,21,347 took it as occasional occupation. Out of all the states and Union territories, maximum number of fishermen were found in Bihar both in 1993 and 1994 with 10,85,871 and 11,13,018 respectively followed by Karnataka in 1993 and Kerala in 1994 (Table-4.14 & 4.15). West Bengal occupies 3rd position both in 1993 and 1994. The position of Assam stood in 6th position among all the states and Union territories in 1993 and 1994. However, the number of people engaged in this occupation as full timer was the highest in Assam in 1993 and stood 2nd following Kerala in 1994. The bottom six states in respect of fisherman population were Dadra & Nagar Haveli, Chandigarh, Sikkim, Mizoram, Delhi, Andaman & Nicobar Islands in the year 1993 and Dadra & Nagar Haveli, Chandigarh, Sikkim, Mizoram, Andaman & Nicobar Islands and Punjab in the year 1994 (Table-4.14).

Table-4.14 State/UT wise Fishermen Population in India (1993 and 1994)

State/Union Territories	1993				1994			
	Full Time	Part Time	Occasional	Total	Full Time	Part Time	Occasional	Total
Andhra Pradesh	151425	132320	212986	496731	151425	132320	212986	496731
Arunachal Pradesh	0	4610	954	5564	0	4751	965	5716
Assam	362819	112181	0	475000	362819	112181	0	475000
Bihar	288034	475736	322101	1085871	295235	487629	330154	1113018
Goa	15709	2439	688	18836	15709	2439	688	18836
Gujarat	52388	24051	63769	140208	52388	24051	63769	140208
Haryana	6814	5046	3940	15800	7050	5094	3890	16034
Himachal Pradesh	3300	5801	4220	13321	3294	3718	1443	8455
Jammu & Kashmir	8302	2449	2249	13000	8302	2449	2249	13000
Karnataka	20688	9849	779931	810468	20688	9849	779931	810468
Kerala	345913	107352	143137	596402	412091	127891	170520	710502

Madhya Pradesh	28856	88916	0	117772	130982	0	0	130982
Maharashtra	67930	46042	311680	425652	67930	46042	311680	425652
Manipur	14961	8362	8677	32000	18675	8112	5563	32350
Meghalaya	2291	3667	4531	10489	2321	3836	4940	11097
Mizoram	0	0	600	600	-	600	-	600
Nagaland	80200	0	82140	162340	90100	0	95250	185350
Orissa	99074	69352	29723	198149	101000	72760	28352	202112
Punjab	1100	2050	950	4100	1200	2050	950	4200
Rajasthan	6576	4853	1654	13083	6170	4649	2738	13557
Sikkim	0	300	250	550	0	300	250	550
Tamil Nadu	111449	111449	-	222898	267309	-	-	267309
Tripura	18561	16786	14463	49810	18853	16815	15287	50955
Uttar Pradesh	30042	71089	59692	160823	30042	71089	59692	160823
West Bengal	298590	298590	-	597180	298590	298590	0	597180
Andaman & Nicobar Islands	2940	510	200	3650	2960	518	200	3678
Chandigarh	200	0	50	250	200	-	50	250
Dadra & Nagar Haveli	120	10	0	130	120	10	-	130
Daman and Diu	14500	3150	12950	30600	14520	3150	13330	31000
Delhi	1030	344	0	1374	1030	400	15000	16430
Lakshadweep	3600	800	1300	5700	3700	830	1470	6000
Pondicherry	8293	1116	0	9409	9871	1100	-	10971
India	**2045705**	**1609220**	**2062835**	**5717760**	**2394574**	**1443223**	**2121347**	**5959144**

Source: Agricultural Research Data Book 2004, Indian Council of Agricultural Research

Table-4.15 Top and Bottom Six States/UTs in 1993 & 1994

Year	Top Six States/UTs in Descending Order	Bottom Six States/UTs in Ascending Order
1993	Bihar, Karnataka, West Bengal, Kerala, Andhra Pradesh, Assam	Dadra & Nagar Haveli, Chandigarh, Sikkim, Mizoram, Delhi, Andaman & Nicobar Islands
1994	Bihar, Karnataka, Kerala, West Bengal, Andhra Pradesh, Assam	Dadra & Nagar Haveli, Chandigarh, Sikkim, Mizoram, Andaman & Nicobar Islands, Punjab

Source: Agricultural Research Data Book 2004, Indian Council of Agricultural Research

4.10. EMPLOYMENT IN FISHERIES SECTOR IN ASSAM:

In Assam, most of the population take agriculture and allied activities like fishery, forestry, etc. as their primary occupation. The numbers of family member getting engagement in fishing occupation of Assam during 2001 to 2016 are shown in table-4.16.

In the year 2001, the number of people engaged in fishing occupation is 10, 65, 520 which consist of male, female and children. In the year 2016, the number has reached 21,72,786 with a continuous increase denoting that the number of fisherman has increased by more than double during the period. Average annual exponential growth of number of fishermen during this

period was 41 percent as represented by the following equation and shown in the diagram 4.1.

$$\text{Ln } Y_t^{\text{Fisherman Population}} = 13.96 + 0.041\ t^* \ldots\ldots\ldots\ldots R^2 = 0.962 \ldots\ldots\ldots\ldots (4.1)$$
$$(0.02)$$

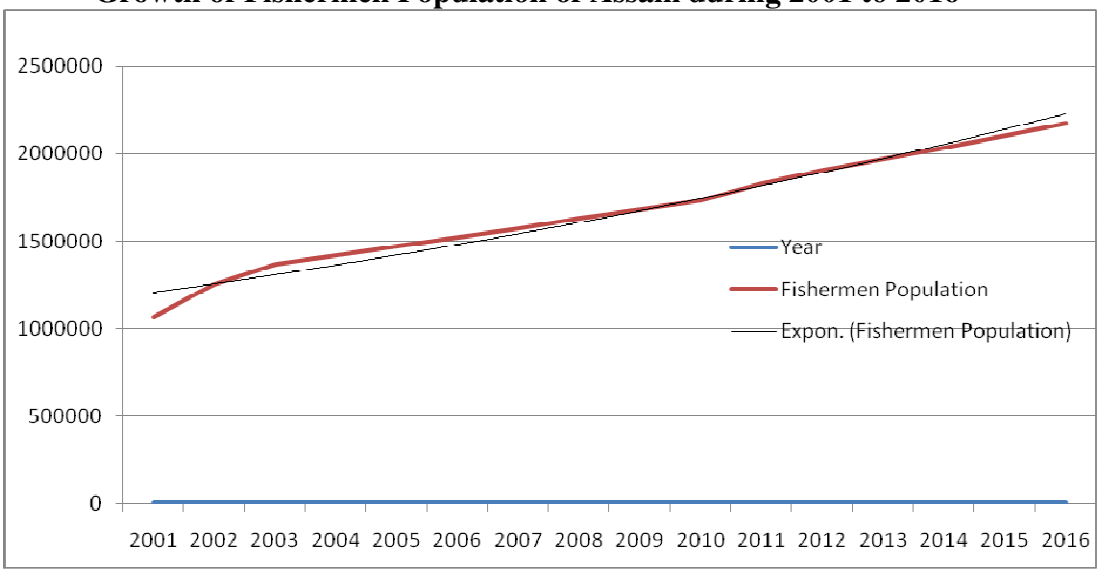
Table-4.16 Fishermen Population of Assam during 2001 to 2016

Year	Fishermen Population
2001	1065520
2002	1253902
2003	1367800
2004	1416729
2005	1467908
2006	1521100
2007	1574100
2008	1626185
2009	1677480
2010	1728183
2011	1827812
2012	1904164
2013	1968811
2014	2035105
2015	2103084
2016	2172786

Source: Official Record, Directorate of Fishery, Government of Assam.

The increase in number of fishermen population in Assam may be due to unavailability of occupation either in industry or in service sector. Moreover, growth of agriculture is not sufficient to cater the increasing population.

Diagram-4.1
Growth of Fishermen Population of Assam during 2001 to 2016



4.11. EMPLOYMENT IN DIFFERENT ACTIVITIES OF FISHERY IN INDIA/ASSAM:

Fishculture is an activity with diversification. People participate in this activity either as a part timer as well as full timer. Their involvement may be as marketing of fish, repairing of nets, processing of fish, etc. The participation of people in different fish related activities whether as part timer or full timer in rural as well as urban Assam and India is presented in table-4.17.

It is noticed from table-4.17 that in rural area participation of people in actual operation of fishing or fish seed collection or both in 1992 was much higher than that of urban area with a ratio of 94.94:5.06. In case of participation in other fish related activities also, percentage of people from rural area was higher than that of urban area. In India, engagement of people in actual operation of fishing or fish seed collection or both in 1992 as full timer was slightly higher than that of part timer. In case of other occupation, engagement of people in marketing of fish were the highest which is followed by repairing of nets and fish processing.

Table-4.17 Distribution of Fishermen in Different Fishing Activities in Assam/India in 1992 ('00 number)

Assam / India	Location	Number of Family Members Engaged in Different Fishing Occupations					
		In Actual Operation of Fishing or Fish Seed Collection or Both		Engaged in Other Occupation			
		Full Time	Part Time	Marketing of Fish	Repairing of Nets	Processing of Fish	Others
Assam	Rural	236	184	123	101	20	-
	Urban	18	17	9	12	6	-
	Total	254	201	132	113	26	-
India	Rural	6087	6776	4042	1944	671	2164
	Urban	1297	361	605	313	204	398
	Total	7384	7137	4647	2257	875	2562

Source: (1)15th Indian Livestock Census 1992, Vol-1, Directorate of Economics and Statistics, Department of Agriculture and Co-operation, Ministry of Agriculture, Government of India.

From table-4.18, it is also revealed that in Assam percentage of people engaged in actual operation of fishing or fish seed collection or both in 1992

as full timer was higher than that of part timer as a whole and at the same time on rural and urban basis also. Engagement of people in the activities related to fish like marketing of fish was the highest, followed by repairing of fish and processing of fish as a whole and rural area. However, in case of urban area, engagement of people in repairing of nets was the highest followed by marketing and processing of fish.

Table-4.18 Distribution of Fishermen in Different Fishing Activities in Assam/India in 2003 ('00 number)

Assam / India	Location	Actual Operation of fishing						Other Occupations				
		Male		Female		Total		Male				
		Full time	Part time	Full time	Part Time	Full time	Part time	Marketing of fish	Repairing of nets	Processing of fish	Fish and Prawn seed	Others
Assam	Rural	626	382	385	215	1010	507	278	96	36	20	2
	Urban	35	46	11	22	46	68	35	12	8	0	0
	Total	661	427	396	237	1057	664	313	108	44	20	3
India	Rural	7081	8316	1019	1342	8100	9658	3331	2207	391	291	2603
	Urban	1069	882	163	181	1232	1063	579	243	71	316	137
	Total	8150	9198	1182	1523	9331	10721	3910	2451	462	607	2740

Sources: Department of Animal Husbandry and Dairying, Ministry of Agriculture, Government of India.

From table-4.18, it is revealed that in India employment of male and female in actual operation of fishing as part time and full time occupation in rural area was much higher than in urban area in 2003. The participation ratio of rural and urban people to total employment was 10.08:09.92. The participation of both male and female in actual operation of fishing as part timer is marginally higher than full timer. In rural areas, the participation of both male and female in actual operation of fishing as part time employment was also marginally higher than full time employment. However, in urban area the employment of both male and female in actual operation of fishing as part timer was lower than full timer. In case of other occupation, the employment of people in marketing of fish is higher followed by repairing of nets, others, fish and prawn seeds and processing of fish. Regarding other occupation, the percentage share of rural area was higher than that of urban area except prawn and seed fish in 2003.

Like all India level, employment of male and female in actual operation of fishing as part timer and full timer in rural area of Assam was much higher than in urban area in the year 2003. However, the participation of male and female in actual operation of fishing in Assam in the year 2003 was fully different from the overall all India level. In Assam, employment of people in fish culture was a full time occupation rather than a part time occupation. It was because of absence of other remunerative occupations in rural area and higher demand for fish leading to higher prices. In case of male as well as female employed in actual operation of fishing in rural area, the participation as full timer was higher than part timer. On the other hand, in urban area, the employment of male and female in actual operation of fishing as part time is higher than that of full time. It was due to the fact that in urban areas people had alternative occupations which would be able to enhance their family income a lot. In case of other occupation, the employment of male is at the top in marketing of fish, followed by repairing of nets, processing, fish and prawn seed and others. Regarding distribution of employment of male in other occupation in between rural and urban areas, the percentage of rural area was higher than that of urban area.

4.12. EXPORT AND IMPORT OF FISH:

Fish and other aquatic products have been one of the important components in international trade. The export value of fish and fishery products of the globe has got double from US $ 71,869 million to US $ 1,48,147 million during 2004 to 2014 with an average annual growth rate of 7.5 percent. World's top ten exporters of fish and fishery products are China, Norway, Vietnam, Thailand, USA, Chile, India, Denmark, Netherland and Canada as depicted in table-4.19. China has been in the 1st position in terms of export value of fish and fishery products during the period 2004 to 2014. The export value of fish and fishery products of China got an increase from US $ 6,637 million in 2004 to US $ 20,980 million in 2014 with an average annual growth rate of 12.2 percent. If we take export value of fish and fishery products in absolute terms, China is followed by Norway and Vietnam.

Export value of fish and fishery products of Norway got an increase from US $ 4,132 million in the year 2004 to US $ 10,803 million in the year 2014 with an average annual growth rate of 10.1 percent while that of Vietnam got an increase from US $ 2,444 million in the year 2004 to US $ 8,029 million in the year 2014 with an average annual growth rate of 12.6 percent. In terms of export value of fish and fishery products, India was able to hold 6th position whose export value got an increase from US $ 1,409 million in the year 2004 to US $ 5,604 million in the year 2014. Although India ranks in 6th position globally in absolute value of fish and fishery products, its stands 1st in terms of average annual percentage growth rate which is 14.8 percent.

Table-4.19
Top Ten Exporters of Fish and Fishery Products during 2004-2014
(US dollar Million)

Country	2004	2014	Average Annual % Growth Rate for 2004-2014
China	6637	20980	12.2
Norway	4132	10803	10.1
Vietnam	2444	8029	12.6
Thailand	4060	6565	4.9
USA	3851	6144	4.8
Chile	2501	5854	8.9
India	1409	5604	14.8
Denmark	3566	4765	2.9
Netherland	2452	4555	6.4
Canada	3487	4503	2.6
World	**71869**	**148147**	**7.5**

Source: *The State of World Fisheries and Aquaculture 2016*

Import value of fish and fishery products of the world got an increase from US $ 75,702 million in the year 2004 to US $ 1,40,616 million in the year 2014 with an average annual growth rate of 6.4 percent. Top ten countries of the world in terms of import of fish and fishery products in absolute value are USA, Japan, China, Spain, France, Germany, Italy, Sweden, UK and Republic of Korea (Table-4.19). Among all the importers of fish and fishery products, USA ranked got 1st position whose import bill got an increase from US $ 11,964 million in the year 2004 to US $ 20,317 million in the year 2014 with an average annual growth rate of 5.4 percent. USA is followed by Japan whose import bill got an increase marginally from

US $ 14560 million in the year 2004 to US $ 14844 million in the year 2014 with an average annual growth rate of 0.2 percent. China which holds 1st position in exporting fish and fishery products in absolute value, is also a major importer holding 3rd position. Its import bill got an increase from US $ 3,125 million in the year 2004 to US $ 8,501 million in the year 2014 with a high average annual growth rate of 10.5 percent. However, in terms of average annual growth rate of import of fish and fishery products, Sweden holds the top position with 13.9 percent.

Table-4.20
Top Ten Importers of Fish and Fishery Products during 2004-2014
(US dollar Million)

Country	2004	2014	Average Annual % Growth Rate for 2004-2014
USA	11964	20317	5.4
Japan	14560	14844	0.2
China	3126	8501	10.5
Spain	5222	7051	3.0
France	4176	6670	4.8
Germany	2805	6205	8.3
Italy	3904	6166	4.7
Sweden	1301	4783	13.9
UK	2812	4638	5.1
Republic of Korea	2250	4271	6.6
World	**75702**	**140616**	**6.4**

Source: *The State of World Fisheries and Aquaculture 2016*

4.13. EXPORT AND IMPORT OF FISH IN ASSAM:

In the global scenario, although India is a major exporter of fish and fishery product with highest average annual growth rate of 14.8 percent, the internal situation is quite different. Within India, some states are net exporters while some other states are net importers. West Bengal, Andhra Pradesh, Tamil Nadu are the states which are exporter of fish and fishery products while states like Assam including all the entire North Eastern states are importers. It should, however, be mentioned that Assam exports some ornamental fish to abroad by some private parties (Das and Biswas, 2008).

Rice and fish composed of the staple food of the Assamese people. Around 90 percent of the population of Assam takes fish as an important source of dietary protein offering the crucial nutritional security. The required per capita consumption of fish per annum for Assamese people as

determined by Indian Council of Agriculture Research (ICAR) is 11 Kg. Thus, demand for fish per annum in the state is calculated by multiplying total population of Assam with the required per capita consumption of fish (i.e.11 kg) for the period 1996 to 2015. An estimation of the growth rate of demand for fish and production of domestic supply of fish during 1996 to 2015 has been made by running semi-logarithmic regression of the form $LnY_t = a + b.t + U_t$, where Y_t represents either production of fish or demand for fish at time t; t is the time in year; a and b are the two parameters. Here, U denotes the random disturbance term and b denotes the annual exponential rate of growth of the concerned variable.

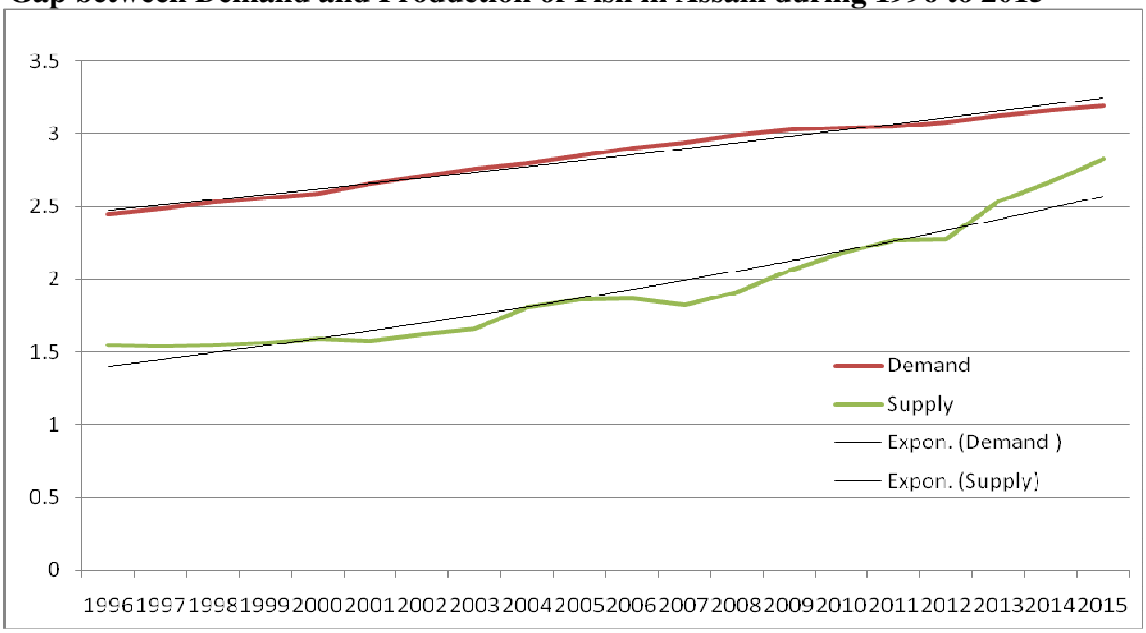
From Table-4.21, it is noticed that population of Assam has increased from 2.47 crs in the year 1996 to 3.23 crs in the year 2015. High growth rate of population may be caused by several factors like excessive dependence on agriculture, joint family system, child marriage in rural areas, religious beliefs and superstitions, immigration especially from Bangladesh, Nepal, etc. All these have resulted in the increased demand for fish during that period of time. The demand for fish has increased from 2.45 lakh tonnes in the year 1996 to 3.19 lakh tonnes in the year 2015. Domestic state production of fish in Assam has got an increase marginally from 1.55 lakh tonnes in the year 1996 to 2.83 lakh tonnes in the year 2015. The increase in production may be attributed to the impact of "Blue Revolution" launched in Assam, increased price of fish, scientific rearing of fish, subsidies and other benefits given by government of Assam to the fish rearers, etc. The gap between demand for fish and domestic state supply of fish reached the highest level (1.12 lakh tonnes) in the year 2007 and then fell continuously to 0.36 in the year 2015 (also shown in Diagram-4.2). This gap has been made up by importing fish from states like West Bengal, Andhra Pradesh, Uttar Pradesh, etc. Which has resulted in an outflow of domestic state income to other states in the name of importing fish of about Rs 200 crs annually (Baruah, 2010).

Table-4.21
Demand for and Supply of Fish in Assam during 1996-2015

Year	Population (in Number)	Fish eating Population (Considering 90% of total Population)	Requirement of Fish in lakh tonnes (considering 11Kg per capita per year)	Production of Fish (in Lakh Tonnes)	Excess Demand (in Lakh Tonnes)
1996	24726000	22253400	2.45	1.55	0.90
1997	25149000	22634100	2.49	1.54	0.95
1998	25531000	22977900	2.53	1.55	0.98
1999	25877000	23289300	2.56	1.56	1.00
2000	26196000	23576400	2.59	1.59	1.00
2001	26854000	24168600	2.66	1.58	1.08
2002	27366000	24629400	2.71	1.62	1.09
2003	27846000	25061400	2.76	1.66	1.10
2004	28332000	25498800	2.80	1.81	0.99
2005	28811000	25929900	2.85	1.86	0.99
2006	29277000	26349300	2.90	1.87	1.03
2007	29738000	26764200	2.94	1.82	1.12
2008	30193000	27173700	2.99	1.91	1.08
2009	30639000	27575100	3.03	2.06	0.97
2010	30715000	27643500	3.04	2.18	0.86
2011	30791000	27711900	3.05	2.27	0.78
2012	31167000	28050300	3.08	2.28	0.80
2013	31540000	28386000	3.12	2.54	0.58
2014	31914000	28722600	3.16	2.67	0.49
2015	32291000	29061900	3.19	2.83	0.36

Sources: (1) Directorate of Fisheries, Government of Assam, Guwahati, Assam.
(2) Directorate of Economics and Statistics, Government of Assam, *Statistical Handbook*, various issues.

Diagram-4.2
Gap between Demand and Production of Fish in Assam during 1996 to 2015



The regression result depicted by equation-4.2 has shown that the annual average exponential rate of growth of demand for fish in Assam during 1996 to 2015 was 1.4 per cent, while it was 3.2 per cent in case of domestic state production (supply) of fish (equation-4.3). It reflects that the domestic producers of fish are able to grow production of fish at a higher rate than the growth rate of population. It is due to the intensive as well as extensive fishculture activities in the state. However, there exists excess demand for fish in Assam as the gap between demand and supply existed at the beginning, i.e.1996.

$$\text{Ln } Y_t^{\text{Fish Demand}} = \underset{(0.001)}{0.892 + 0.014\ t^*} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots R^2 = 0.981\ldots\ldots\ldots\ldots\ldots\ldots (4.2)$$

$$\text{Ln } Y_t^{\text{Domestic Fish Production}} = \underset{(0.002)}{0.308 + 0.032t^*} \ldots\ldots\ldots\ldots\ldots\ldots R^2 = 0.925\ldots\ldots\ldots\ldots\ldots\ldots (4.3)$$

Notes: $Y_t^{\text{Fish Demand}}$ and $Y_t^{\text{Domestic Fish Production}}$ represent demand for fish and domestic supply of fish at time t respectively.

Here, * indicates that the coefficient is significant at both 5 and 1 per cent level of significance by two-tailed test.

The terms in the brackets represent standard error of the corresponding coefficient.

4.14. CONCLUSION:

In a nutshell, we can see that world production of fish has been increasing over the years and China's role to global fish production is also improving and contributed around 47 per cent of global fish production in 2015. India's contribution to global fish production is around six per cent in 2015. In case of inland fish, again China ranked first followed by India and Indonesia in 2015. In case of marine fish production also, China ranked first followed by Indonesia and USA in 2014. In the production of seed fish in India, West Bengal ranked first followed by Andhra Pradesh, Odisha and Assam.

Although share of agriculture to GDP has been declining, the share of fishery sector in GDP at current prices of India is around one per cent and has been increasing due to increase in production and price of fish over the years. However, share of fishery sector to the GDP from agriculture is more than five per cent. In Assam also, although the share of

primary sector to GDP at current prices and constant prices has been decreasing, share of fishery sector to primary sector both at current and constant price has been increasing.

Fishery sector has been providing employment to lakh of male, female and children in different activities. Out of total employment in fishery sector, majority are children (39.73%) followed by male (32.42%) and female (27.85%). Fishery sector provides employment to maximum in Bihar followed by Karnataka, West Bengal, Kerala, Andhra Pradesh and Assam in 1993 and Bihar, Karnataka, Kerala, West Bengal, Andhra Pradesh and Assam in 1994. In Assam, number of fishermen has been increasing at 41 per cent annually during 2001 to 2016. Moreover, number of people engaged in fishery sector as full time is higher than part time in Assam. Engagement of people is the highest in repairing of nets followed by marketing of fish and processing of fish in Assam.

While average annual percentage growth rate of fish and fishery product (in US dollar) was 7.5 per cent in the world, it was the highest in India with 14.8 per cent followed by Vietnam (12.6%) and China (12.2%). during 2004 to 2014. Sweden was the major importer of fish and fishery product followed by China and Germany during the same time period. Although production of fish has been increasing in Assam, its demand is more than its supply for which the state has been spending Rs.200 crores annually in the import of fish.

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