TYPE STUDIES FOR UPDATING RATES AND RATIOS USED IN GSDP ESTIMATION FOR SUBSISTENCE FISHING

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Acronym

AFDC: Assam Fisheries Development Corporation

CIFRI: Central Inland Fisheries Research Institute

CSO: Central Statistical Organization

DES: Directorate of Economics and Statistics

FSU: First Stage Unit

GDP: Gross Domestic Product

GSDP: Gross State Domestic Product

GVA: Gross Value added

ICAR: Indian Council of Agricultural Research

ISIC: International Standard Industrial Classification

NAS: National Account Statistics

NIC: National Industrial Classification

NPI: Non-Profit Institution

PSU: Public Sector Undertaking

SFD: State Fisheries Departments

SHG: Self Help Group

SNA: System of National Accounts

SPSS: Statistical Package for the Social Sciences

SRSWOR: Simple Random Sampling without Replacement

SSS: Support for Statistical Strengthening

UN: United Nations

USU: Ultimate Stage Unit

Executive Summary

The performance of an economy is assessed by preparing national accounts which is a comprehensive, conceptual and accounting framework. One key indicator that most commonly quoted while preparing the National Accounts is Gross Domestic Product (GDP). GDP is an indicator of the health of a national economy and economic growth. It represents the monetary value of all products and services produced in the country within a defined period of time. The procedure adopted for compilation of GDP is to measure the production activity in each producer unit by means of what is called, Gross Value added (GVA). GVA is the measure of the value of goods and services produced in an area, industry or sector of an economy. Gross value added is the value of output minus the value of intermediate consumption. GDP is defined as the sum of GVA of all resident producer units of the economy during the reference period. The GDP of a country can be measured by three different approaches, that is, production approach, income approach and expenditure approach.

In India the Agriculture & Allied Sector consists of four sub sectors namely Crop sector, Livestock, Forestry and Fisheries. Fish is an important food source; fisheries are next to agriculture in terms of providing employment and food supply. Fisheries mainly consist of two important sectors namely, marine fishery and Inland fishery. Both sectors play an important role in Indian economy. The estimate of GDP in respect of the fishing sector is based on production approach. There are mainly four activities covered under the fishing sector. They are commercial fishing, subsistence fishing, gathering of seaweeds, sea shells, pearls, sponges and other ocean and coastal water products and finally fish curing which mainly includes salting and sun-drying of fish.

The concept of subsistence fishing refers to fishing, other than sport fishing, that is carried out primarily to feed the family and relatives of the person doing the fishing. The National Accounts Statistics Guidelines emphasize productions of fishing which are used for own consumption to be included in the production boundary for calculation of GDP of the country. Hence subsistence fishing is a part of the fishing sector.

Inland fisheries enjoy a prime place in Assam's economy. Assam abounds in aquatic resources necessary for development of fisheries. About 88.5% of households in Assam eat fish. Therefore, subsistence fishing plays an important role in the economy of Assam. However, the catches from subsistence fishing are comprehensively accounted for in the Gross State Domestic Product (GSDP) of the state economy. The data supplied by the State Fisheries Departments includes production from subsistence fishing. However, the last few years have witnessed a growth in

pisciculture in the state. As per recent data, the per capita fish consumption in the state has increased from 8.5 kg per annum in 2015-16 to 11.12 kg per annum in 2019-20. In view of the increased demand and production of fish in the state, the need to confirm the existing rates and ratios used in GSDP estimation for subsistence fishing become relevant.

Research Objective

The purpose of the study is to provide updated rates and ratios used in Gross State Domestic Product (GSDP) estimation for subsistence fishing to that of total fishing production. Accordingly, the following objectives have been set for the study.

- ▪ To compute the rates in terms of quantity of subsistence fishing as a percentage of total production of fishing.

- ▪ To compute the rates in terms of value of subsistence fishing as a percentage of total production of fishing.

- ▪ To highlight the related economic impact of subsistence fishing in terms of output and employment in the state of Assam.

Research Design

The survey is expected to provide updated rates/ ratios of subsistence fishing to that of entire production of fishing and aquaculture. Therefore, the study is a combination of Household Survey and Enterprise Survey. It has independently estimated the quantity and value of subsistence fishing (through household survey) and commercial production (through enterprise survey). The study used a two-pronged approach to collect relevant data on fishing. The approach consists of quantitative survey of both households as well as commercial units using structured schedules, and qualitative survey using key informants.

Sampling Methodology

Household Survey: A stratified multistage random sampling design has been adopted for household survey. The first stage units (FSU) are the large primary sampling unit, that is, districts selected for the survey. The ultimate stage units (USU) are the households. The first stage of the sampling is to select a large primary sampling unit, that is, districts. A total of nine districts viz, Barpeta, Cachar, Dhubri, Dibrugarh, Jorhat, Kamrup-Rural, Lakhimpur, Morigaon and Sonitpur have been selected from five stratum (agro climatic zone) excluding hill zone. Taking time and cost into consideration, the household target sample size has been set to 845 households. The sample size of 845 has been allocated to five strata using the method of proportional allocation

as per the census 2011 district household data. The Ultimate Stage Units (USU) households were selected by using simple random sampling without replacement methods.

Enterprise Survey: A stratified two-stage mixed sampling design with the ultimate sampling units being the fish farmer or fishing enterprise has been adopted under this survey. The first stage units (FSU) are the districts selected for the survey. The ultimate stage units (USU) are the fishing enterprises/ fish farmers. A total of 384 fishing enterprises were selected using statistical formula

Key informant interviews: With the objective of estimating the percentage of fishing households, qualitative data collection methods with key informants were used. Village headman for rural areas and district fishery officials for urban areas were interviewed to get an overview of the percentage of households engaged in fishing.

Household Survey- Key takeaways
The main key takeaways from the household survey are as follows:
- Out of total 845 respondents in the household survey, 55% households engaged in subsistence fishing implies that they do fishing for households' consumption and do not sell any part to earn money. 20% of the respondents are artisanal fishermen or part time fishermen whose primary job is not fishing but they do sell fish in the market for profit and finally 25% respondents are full time commercial fishermen whose primary job is fishing.

- The average numbers of members permanently living in the household are 5.3 members

- 40% of the respondents during the survey informed their primary occupation as agriculture and allied activities, 25% of the respondents exclusively engaged in fishing, 20% are self-employed with their own business, 5% of the respondents are employed in various sectors and 10% of respondents are outside the above categories.

- About 97% of the respondents household consume fish

- 45% of the respondents informed that they consume fish 1 to 3 times a week, around 42% of the household eat fish 4 to 6 times a week, 6.7% of the household informed that they consume fish daily, 4.3% eat once a week, 1.7% eat once or twice a month and only 0.1% of the household informed that they do not consume fish due to religious reasons but they do fishing for livelihood.

- Commercial fisher households consume approximately 9.7 kgs of fish per month followed by artisanal/part time fisher household 9.3 Kgs and subsistence family members consume about 8.4 kgs of fish per month.

- The full-time fishermen household fulfill 89% of their monthly fish requirement through own catch. Subsistence fisher household sources approximately 55% and artisanal fishermen households sourced around 74% of their requirement through self-fishing.

- Commercial fishermen do fishing about 22 days a month. While artisanal fishermen do about 14 days and subsistence households do approximately 10 days of fishing.

- The average hours spent by different fishermen on any particular day on fishing are commercial 4.3 hours, artisanal 2 hours and subsistence 1.5 hours.

- The commercial fisher household sells approximately 77% of their catch in the market and artisanal fishermen sell around half of their catch which is 49.3%

- The average earnings of commercial fisher households is Rs. 5598/- per month, while for artisanal households it is Rs. 4022/- per month.

- Nets (37%) are the most common gear used by the entire fishermen household followed by line fishing (20%), bag nets (19%), traps (13%), boats (2%) and wounding gear (1%). Gears other than the mentioned above are 9%

- The survey also calculated the input or intermediate cost for subsistence fishing which is Rs. 529/-

- Among the vast water resources available in the state, Beels (33%) and Ponds (33%) are the most preferred places of fishing followed by Rivers (21%), Swaps (10%) and others (3%) respectively.

- At the aggregate level, the catch of major carp fish is maximum among commercial fishermen (37%) and artisanal fishermen (33%). The highest percentage of catch among subsistence fishermen are live fish which account for 31% followed by small fish 30%.

- The average monthly quantity of catch for commercial household (57.3 kgs), artisanal household (17.2 kgs) and subsistence fisher household (6.74 Kgs) respectively.

- The household survey reveals the average retail rates of various categories of fish available in the state. The cost of big categories of fishes are Rs. 370/- per kgs followed by live categories of fish at Rs. 323/- per kg, major carps at Rs. 228/- per kg and small categories of fish at Rs 186 per kg.

Enterprise Survey- Key takeaways

The major findings of the enterprise survey are presented below.

- It has been found from the enterprise survey that majority of fishermen runs their establishment as proprietary concerns (67%) followed by private sector establishment (23.2%), Self-help group (5.7%) partnership business (2.9%), cooperative societies (1%), and private limited company (0.3%).

- For commercial fishing 92% of the respondents informed about doing culture fisheries in ponds and tanks. Only 4.4% respondents do fishing in beels and 3.4% in rivers.

- Winter is the most favorable season for fishing. About 39% of the total annual production happens during this season followed by post-monsoon (24%), Pre-monsoon and summer (18% each) respectively.

- Major carps are the most sought-after fish of the state. About 48% of the total production represents major carps which includes Rohu, Bhokua/Catla, Mirka, grass carp, silver carp etc. Next to major carp categories are minor carp (20.55%), Exotic fish (10.14%), big catfish (5.76%), and high value small fish (5.56%), live fish (4.92%), low value small fish (4.51%), minor catfish (0.3%) and others (.07%) respectively.

- At the aggregate level, the wholesale price of fish in the state of Assam is Rs. 255/- per kg. The wholesale rate of Indian major carps which constitute almost 50% of the total production is at Rs. 176/- per Kg.

- The overall retail rate of fish in the state is Rs. 353/- per kg.

- On an average the spread between wholesale and retail rate across different categories of fish is around 38%.

- The total value of production of the sampled survey is Rs 17, 59, 87,030/- (Rupees Seventeen crores fifty-nine lacs eighty-seven thousand thirty only) across nine sampled districts.

- The three major components of input costs are fish seed (33%), fish feed (26%) and fertilizers or manure (12%). These three components constitute 71% of the total cost.

- The operational cost which includes labor cost (10%), marketing & transportation (3%), various repair and maintenance (10%), fuel & electricity (2%), others (4%) constitute 29% of the total fishing costs.

Major findings

The overall findings from household survey, enterprise survey and key informant interviews are as follows:

- The total inland fish production (raw form) excluding salting, sun drying and subsistence fishing for the state during the reference period 2018-19 is 312012.23 tonne.

- The percentage of subsistence fishing to that of total inland production (raw form), excluding fish curing (sun drying and salting) for the state of Assam is 9.84%.

- Fish curing involves mostly sun drying, fermentation and salting of fish in the state. As per the available secondary data, the total production in terms of quantity for dry fish in the state of Assam is 1080 tonne and the average wholesale price per kg is Rs. 88.49/-. The overall output in terms of value for dry fish as per the above estimate is Rs. 9,55,69,200/- (Rupees Nine Crores Fifty Five Lacs Sixty Nine Thousand Two Hundred Only) in the state.

- As per the study estimate, the production for the state for the year 2018-19 is 343779.09 tonne while as per Directorate of fisheries, Govt. of Assam, the fish production for the 2018-19 was 331099.34 tonne. Hence the fish production data for the state as per the survey is 3.83% higher than the government estimate.

- The overall percentage of expenditure on inputs to value of output from fish farming in the state of Assam is 46.95%, while the percentage of intermediate cost is 13.14%. The intermediate cost is mainly the operational costs; it is the expenses towards the use of equipment for fishing and not the cost of purchase or value of the assets.

- The intermediate costs for the subsistence fishing arrived at 2.56%. The intermediate cost is essential in order to calculate the Gross Value Added (GVA) of subsistence fishing.

- As per the estimate, the total production from fishing sector including inland fish in raw form, subsistence fishing and fish curing is estimated at Rs. 8748.38 crores.

- One of the important elements of GVA is to compute the value of various input used in fishing. The total value of input cost for the state of Assam for the year 2018-19 is Rs. 1069.11 crores.

- The Gross Value Added (GVA) of the fishing sector in the state of Assam for the period 2018-19 is 7679.27 crores.

- The contribution of fishing and aquaculture to the state GSDP at current price for the year 2018-19 is 2.37% and to the primary sector is 8.88%

- The study calculates the unsold output from subsistence fishing as a proxy for opportunity costs. As per the estimate, the opportunity cost of labor for subsistence fishing in the state of Assam is Rs. 1660.43 crores.

Chapter 1. Introduction

1.1   Concept of National Accounts

For evaluating the performance of an economy, national accounts are being prepared which is a comprehensive, conceptual and accounting framework. As the national accounts are designed to account for all economic transactions, it involves compilation of information from several diverse data sources. The underlying concepts and methodology of compilation of information has been mostly standardized under the UN System of National Accounts (SNA). For making the estimates comparable internationally and over time, the Central Statistical Organization (CSO) of India maintains detailed, well documented methods and procedures[1].

Typically, governments, international agencies, and private corporations use national accounts to monitor developments within an economy. In particular, they are used to: (i) Monitor changes in economic activity; (ii) Make cross-country comparisons; (iii) Prepare time-series analysis; (iv) Identify functional relationships; and (v) Determine aid eligibility/requirements. National accounts are compiled for a succession of time periods, thus providing a continuing flow of information that is indispensable for the monitoring, analysis and evaluation of the performance of an economy and its components over time. They usually provide information not only about economic activities but also about the levels of an economy's productive assets and the wealth of its inhabitants at particular points of time[2].

1.2   Concept of GDP

One key indicator that most commonly quoted while preparing the National Accounts is Gross Domestic Product (GDP). GDP is a measure of production activity. The procedure adopted for compilation of GDP is to measure the production activity in each producer unit by means of what is called, Gross Value added (GVA) by the unit, where   GVA is the value of output minus the value of input used up in the process of production. Hence GDP is defined as the sum of GVA of all resident producer units of the economy during the reference period[3]. GDP measured at current prices is called GDP at current prices or nominal GDP. If it is measured using prices that prevailed in a particular year called base year, it is known as GDP at constant prices or real GDP.

Similarly, Gross State Domestic Product (GSDP) is a measure in monetary terms of the volume of all goods and services produced by an economy during a given period of time accounted for

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[1]National Accounts Statistics-Sources and Methods, 2012

[2]The Contribution of Fisheries to the Economies of Pacific Island Countries, Robert Gillett and Chris Lightfoot

[3]National Accounts Statistics-Sources and Methods, 2012

without duplication. GSDP is a reflection of economic development of the State and its determinate per capita income is a suitable measure of the well-being of its people[4].

The term used in national accounts for denoting the input consumed in the production process is known as Intermediate Consumption. GDP covers all production activities recognized by the UN System of National Accounts (SNA) called the production boundary. The production boundary covers production of almost all goods and services classified in the National Industrial Classification (NIC) which has been prepared in conformity with the International Standard Industrial Classification (ISIC).

The GDP of a country can be measured by three different approaches. They are production approach, income approach, and expenditure approach. All these three forms are circular in nature. In other words, all three approaches are derived from the same data, by definition; the GDP calculated by each should be identical.

- **Production Approach**: The production approach views the economy from the perspective of production. The approach measures the gross output of each producer then deducts the value of the goods and services purchased from other producers and used in the production process.

- **Income Approach**: The income approach measures the major components of value added, that is, employee compensation (wages and other remuneration), operating surplus (company profits), and indirect taxes net of subsidies. The sum of these components is the value-added to GDP.

- **Expenditure approach**: It is based on the final use of the output produced. It sums the expenditures of the main participants in the economy: government final consumption, private final consumption, gross capital formation, and net exports.

1.2.1 Methodology for Computing GDP in Fishing Sector in India

Broadly, the methodology for compiling the estimates of GDP consists in dividing the whole economy into various sectors comprising primary, secondary and tertiary activities. In India the Agriculture & Allied Sector consists of four sub sectors namely Crop sector, Livestock, Forestry and Fisheries. The estimate of GDP in respect of fishing sector is based on production approach[5].

The activities covered in the fishing sector are given under Table 1.

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[4]Estimates of State Domestic Product of Delhi 2015-16, DES, New Delhi

[5]Gross domestic Product | Ministry of Statistics and Program Implementation | Government Of India

Table 1: Type of fishing and activities

No.	Type of fishing	Activities involve
(i)	Commercial Fishing	In ocean, coastal and offshore waters & Inland waters, that includes catching, tackling and gathering of fish from rivers, irrigation and other canals, lakes, tanks, fields inundated tracts etc.
(ii)	Subsistence fishing	In inland waters and artificial ponds
(iii)	Gathering of	Sea weeds, sea shells, pearls, sponges and other ocean and coastal water products and
(iv)	Fish curing	Salting and sun-drying of fish. Activities of salting and sun-drying of fish are also included in this sector, since these are undertaken predominantly by the same households, which are engaged in commercial/subsistence fishing

Source: National Accounts Statistics-Sources and Methods, 2012

Thus, the GVA from the fishing sector is estimated by production approach. It involves the estimation of total value of output at factor cost[6] and deducting there from the value of various inputs at purchasers' prices which are used in the process of production.

1.3   Concept of Subsistence Fishing

One of the most basic issues in calculating a sector's contribution towards Gross Domestic Product (GDP) is the nature of activities that are included in the estimation of domestic product. However there are few goods and services activities that are for personal or households' own consumption. For example, house cleaning is not included if carried out by the family. These goods and services are known as non-market production or subsistence production. However, if goods and/or services produced for own consumption could reasonably be sold, they are incorporated in the GDP. Subsistence fishing is such an example. While the fish may have been caught for a family's own consumption, the convention assumes that the fish could have been sold and, therefore, it should be treated as adding value to the economy[7].

Hence the National Accounts Statistics Guidelines emphasis productions of fishing which are used for own consumption to be included in the production boundary for calculation of GDP of the country. Clearly, this can be a significant issue in fisheries in the states in India particularly in Assam, where large numbers of households rely on fishing for their own consumption. The GVA

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[6]Factor cost mean output is measured without adding any tax and subtracting any subsidy

[7]The Contribution of Fisheries to the Economies of Pacific Island Countries, Robert Gillett and Chris Lightfoot

for subsistence fishing is also estimated by production approach. It deducts the value of various inputs at purchasers' prices which are used in the process of production from the total value of output from subsistence fishing.

$$\text{GVA=}(Value\ of\ Output\ from\ Subsistence\ Fishing\ at\ factor\ cost - \\ Input\ Cost\ of\ Subsistence\ Fishing)$$

1.4 Overview of Fishing Sector

Fish is an important food source, accounting for close to one-fifth of global animal protein intake. Fishing provides livelihood for millions of people as well as providing valuable foreign exchange earnings to the country. It is a highly perishable food, requires proper handling, processing and distribution.

Fisheries are next to agriculture in terms of providing employment and food supply. Fish is an important source of quality protein and cheaper in cost compared to other sources of animal protein. About 35% of Indian population is fish eaters and the per capita consumption is 9.8 kg whereas the recommended intake is 13 kgs[8].

There are two important sectors in fisheries namely, marine fishery and inland fishery. Both sectors play an important role in Indian economy. Inland fisheries enjoy a prime place in Indian economy specifically to the state of Assam. It provides employment and livelihood for fishers who solely depend on it. Fisheries are a renewable natural resource, subject to its own dynamics, acted upon by various forces. Fishery sector contribution to the Gross Value Added (GVA) for 2016-17 at current price in India is 0.96% and its contribution to the agriculture sector is 5.37%[9]

1.4.1 State Fishing Sector

Assam is situated in the North-East region of India – bordering seven states i.e., Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Tripura and West Bengal and two countries, that is, Bangladesh and Bhutan. The total geographical area of the state is 78,438 sq. Km. It consists of 33 districts including six newly created districts (Biswanath, Charaideo, Hojai, South Salmara/ Mankachar, West Karbi Anglong & Majuli). Assam shares about 2.4% of the country's total geographical area and provides shelter to 2.6% population of the country as per 2011 census[10].

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[8] Manual on Fishery Statistics, CSO-MFS-2011

[9] Handbook on Fisheries Statistics 2018

[10] Economic Survey Assam 2017-18

Fishery plays an important role in the economic development of the state. It also plays a significant role in income and employment generation throughout the state. Assam abounds in aquatic resources necessary for development of fisheries. The two main rivers Brahmaputra and the Barak along with their 53 tributaries and numerous floodplain lakes (beels) and ponds constitute traditional sources of fishing in the State. The undulating topography and high rainfall has given rise to vast and varied fisheries resources.

Rice and fish are the two basic items in the diet of the Assamese people. About 88.5% of household in Assam eat fish[11]. Therefore, subsistence fishing plays an important role in the economy of Assam. Most rural households in the state of Assam do at least some subsistence fishing. The catches from subsistence fishing are comprehensively accounted for in the GSDP based on the data supplied by the respective State Fisheries Departments (SFD). However, no reliable data are available for subsistence fishing activities. As a result, the importance of fisheries to the state's economy may be considerably undervalued in cases where subsistence fishing is significant, yet underreported.

Fish production in Assam has reached a level of 3.31 lakh metric ton during 2018-19 against the estimated nutritional demand of 3.42 lakh metric tons. The contribution of the fishery sector to the Gross State Domestic Product of Assam at current price for 2018-19 was Rs. 7646.71 crores[5].

The fishing production of the state and the country is stated below under Table 2.

Table 2: Fish Production of the Assam and India

2018-19	Assam	India
Fish production (in million metric ton)	0.33*	13.7**
Contribution of fisheries to GSDP/GDP	2.36 %*	1.07%***

Sources:

* Statistical Handbook Assam 2019

** https://economictimes.indiatimes.com/news/economy/agriculture/fisheries-sector-registered-more-than-double-growth-in-past-5-years-emerged-largest-group-in-agri-export-economic-survey/articleshow/70071062.cms?from=mdr

*** https://www.financialexpress.com/opinion/indias-blue-economy-net-getting-bigger-country-ranks-third-in-fisheries-and-second-in-aquaculture/1867607/

As shown in the Table 2, Assam's fishing and aquaculture contribution of 2.36% to the state GSDP is far above than the contribution of 1.07% to country's GDP

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[11] Statistical Handbook Assam, 2019

1.4.2 Fishery Resources in Assam

The Inland fishery resources of Assam can be classified under three broad categories

   i)   **Capture fishery:** Refers to riverine fishery

   ii)   **Culture fishery (aqua-culture):** It includes ponds and tanks, and integrated culture systems; and

   iii) **Culture-based fishery:** It includes beel fisheries, reservoir fisheries, and swamps and low-lying areas.

The varied water resources along with water areas of the state are given under Table 3.

Table 3: State water resources

Resources	Number	Water Spread Area (in hectares)
Beels /Ox-bow lakes	Registered: 430,	60215
	Unregistered: 767	40600
Forest Fisheries	71	5017
Derelict water bodies/swamps/low-lying	3882	116444
Reservoir fisheries	2	2553
Individual Ponds	369304	56566
Community Tank	6328	5152
Total Hectares		**286547**

Source: Directorate of fisheries, Govt. of Assam

1.4.2.1 Capture Fishery (Riverine Fisheries)

Capture fishery refers to fishing in open waters like rivers, where the catch depends on the natural fish stock. The Brahmaputra and the Barak River systems constitute capture fisheries in Assam. The Brahmaputra flows through the Assam valley from the east to the west for a distance of 730 kms. About 47 tributaries, both from the north and the south banks feed the Brahmaputra during its course. In its initial course of 530 km till Guwahati, the Brahmaputra has a steep slope and strong surface and under current. This makes commercial fishing difficult with the existing indigenous methods of fishing. The remaining 230 km from Guwahati to Dhubri is exploited commercially for fishing. Some of the finest fish species in the world are found in the Brahmaputra such as the Indian major carps and catfishes.

The river Barak rises in the Japfu peak and flows south-west for 100 km parallel to two ranges lying on both sides and then turns first to the north and then to the west through the Cachar plains. Thirteen tributaries, seven from the north and six from the south join the Barak during its course. Commercial fishing is practiced across the entire river[12].

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[12]Land Use In Assam A Spatial-Temporal Study

1.4.2.2 Beel Fisheries

Wetlands associated with the floodplains of rivers are known as floodplain wetlands. Any kind of aquatic formations on the floodplains, irrespective of their origin are called beels. Three types of beels are found in Assam viz., ox-bow lake type, lake- like wetlands and true tectonic depressions.

- *Ox-bow lakes:* These are cut off portions of river meanders. The basins are relatively narrow, long, deep and have either bent or straight shapes. They derive the name from their shape, which is usually horse-shoe shaped, crescent shaped or serpentine. They receive water from the parent river through the old channel or neighboring catchment areas.

- *Lake-like wetland:* These are wide and shallow with irregular contours. They may be connected to the river through channels or receive water from it during floods. During the monsoon season, the entire neighboring area gets flooded, turning the beel into a vast sheet of water whereas during non-monsoon seasons the water spread area shrinks to the basin proper.

- *True tectonic depressions:* These are created by tectonic activities like earthquakes and usually resemble natural lakes with regular contours. Normally, they are not connected to rivers through connecting channels but may receive water from the latter during floods. Such tectonic wetlands are common in the northeastern region[13].

1.4.2.3 Registered Fisheries

Registered fisheries include reservoirs. Currently there are two reservoirs developed in the state. Khandong and Umrong are two reservoirs created under the Kopili Hydro-electric Project.

1.4.2.4 Ponds/Tanks

Ponds are the most important source of culture fisheries in the state. Fish culture in ponds is a deep-rooted tradition of Assam.

1.4.2.5 Derelict water bodies/swamps/low-lying areas

Assam has approximately 3882 numbers of derelict water bodies/swamps/low-lying areas covering 116444 hectares of water spread. These are mostly ecologically disrupted water bodies in the form of swamps. They are either perennial or seasonal water retaining bodies which are mostly in a derelict state. However, these water bodies are ideal for raising live-fishes. Swamps and derelict water bodies are mostly used for subsistence fishing in Assam.

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[13]Ecology and Fisheries of Beels in Assam, CICFRI, Barrackpore

1.5 Definitions

For the purpose of the study, the definitions used within this report are as follows[14]:

- **Subsistence Fisher**: Households who reported predominantly consuming all of their catch but not selling the catch.

- **Commercial Fisher**: Households who reported primary occupation as fishing.

- **Artisanal Fisher**: Households whose primary occupation is not fishing but they predominantly sell part of their catch and retain part of it for their own consumption.

Hence for the purpose of this report we are considering those household as subsistence fishermen whose occupation is not fishing and who reported predominantly consuming all of their catch within the family.

1.6 Research Objectives

The purpose of the study is to provide updated rates and ratios used in Gross State Domestic Product (GSDP) estimation for subsistence fishing to that of total fishing production. Accordingly, the following objectives have been set for the study.

- To compute the rates in terms of quantity of subsistence fishing as a percentage of total production of fishing.

- To compute the rates in terms of value of subsistence fishing as a percentage of total production of fishing.

- To highlight the related economic impact of subsistence fishing in terms of output and employment in the state of Assam.

1.7 Research Design

In order to achieve the above-mentioned research objectives, both primary as well as secondary data were used in the study. For the primary data, appropriate sample size has been selected and for secondary data, desk review on available literature and related surveys were done.

The survey is expected to provide updated rates/ ratios of subsistence fishing to that of entire production of fishing and aquaculture. Therefore, the study is a combination of Household Survey and Enterprise Survey. It has independently estimated the quantity and value of subsistence fishing (through household survey) and commercial production (through enterprise survey). The cumulative figure from both the surveys has provided the percentage of subsistence fishing to that of total production in the state. Consequently, this study has not only provided the actual

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[14]A Survey of the Subsistence and Artisanal Fisheries in Rural Areas of Viti Levu, Fiji & South African Journal of Marine Science

contribution of subsistence fishing to inland fish production but also estimated the total production from inland water resources in the state of Assam.

The activities covered under this study are fishing in (i) inland waters that include catching, tackling and gathering of fish from rivers, beels, lakes, tanks, fields etc. and (ii) subsistence fishing in inland waters and artificial ponds.

1.8   Research Methodology

The study used a two-pronged approach to collect relevant data on fishing. The approach consists of quantitative survey of both households as well as commercial units using structured schedules, and qualitative survey using key informants.

1.8.1 Research Tool

The methodology for the study was based on a combination of structured schedules and one-to-one interviews to collect quantitative and qualitative data. . The following three major groups of respondents were included in a survey for the study:

- *Households:* Randomly selected households who engaged in some form of fishing in the past twelve months.

- *Commercial Fisherman*: Fish farmers and fish producers whose prime occupation is fishing and

- *Key informants*: The evaluation process has included a number of informal discussion sessions with village heads (Gaonburah), representatives of Fishery Departments, traders etc to understand the overall scenario of the fishing sector in Assam.

1.8.1.1 Quantitative Survey

The quantitative survey was carried out using structured specialized respondent-specific schedules given below

- *Household Schedules*: The household Schedules were prepared in English language and translated into the local Assamese language. Copy of the translated schedules has been given to each enumerator for ready reference. A copy of the household Schedules can be found in Annexure 1 and translated version in Annexure 2

- *Fishing and Aquaculture Establishment Schedules*: Similar to the household schedules, the fishing and aquaculture establishment schedule has also been translated into local language and distributed to the enumerators for ready reference. The full schedules can be found in Annexure 3 and translated version in Annexure 4

1.8.1.2 Qualitative Survey

The qualitative survey was carried out using the guide for key-informant interviews given in Annexure 5

1.8.2 Pre-testing Process

Household Schedules: The household Schedules have been pre tested in the district of Kamrup, Morigaon and Sonitpur in the month of July 2019 with 62 households to detect any ambiguities in the Schedules. After the pre-testing, some questions were reformulated, as some respondents encountered difficulties and/or were confused with some of the questions asked.

Fishing and Aquaculture Establishment Schedules: The enterprise Schedules are being pre-tested in the district of Kamrup (Rural), Morigaon and Barpeta in the month of November 2019 with 8 enterprises in the district of Kamrup, Morigaon and Barpeta.

Image 1: Pilot Survey

1.9 Household Survey-Sampling Methodology

1.9.1 Sample Size

One of the key factors of the study is to estimate an optimum sample size. An optimum sample size is one which fulfils the requirements of efficiency, representativeness, reliability and flexibility. Hence while deciding the sample size, the researcher has taken into consideration the cost, time available, desired precision and acceptable confidence level to arrive at the optimum sample size. For estimating the sample of households for the survey, the following statistical formula has been used.

$$n = \frac{\frac{z^2 * p * (1-p)}{e^2}}{1 + (\frac{z^2 * p * (1-p)}{e^2 * N})}$$

Where,

n= Sample Size

z= the value of standard variate at a given confidence level. It is assuming at 2.33 for 98% confidence level

p= sample proportion. It is estimated the value of p=0.5 in which case 'n' will be maximum and the most conservative sample size.

e= Acceptable error. It is estimated at 0.04 which is sample size with 4% margin of error

N= 6406471 that is, size of population (total number of households as per census 2011)

$$n = \frac{\frac{2.58^2 * (.5) * (1-.5)}{(.04)^2}}{1 + (\frac{2.58^2 * (.5) * (1-.5)}{(.04)^2 * 6406471})} = 845$$

As per the above statistical formula, the minimum sample size required for quantitative survey at 98% confidence level and 4% margin of error is 845.

1.9.2 Outline of Sample Design

A stratified multistage random sampling design has been adopted for household survey. The first stage units (FSU) are the large primary sampling unit, that is, districts selected for the survey. The ultimate stage units (USU) are the households.

1.9.2.1 Formation of Strata

Based on the rainfall pattern, terrain and soil characteristics, the state has been divided into six Agro-climatic zones[15]. They are Lower Brahmaputra Valley Zone, Central Brahmaputra Valley Zone, Upper Brahmaputra Valley Zone, North Bank Plains Zone, Barak Valley Zone and Hills Zone. For the purpose of the study, the six agro climatic zone has been categorized as individual stratum. Each individual stratum is coded as 101,201,301,401,501 and 601 for Lower Brahmaputra Valley Zone, Central Brahmaputra Valley Zone, Upper Brahmaputra Valley Zone, North Bank Plains Zone, Barak Valley Zone and Hills Zone respectively. Table 4 provides the list of districts under each climatic zone.

Table 4: Agro climatic zones and list of districts

Sl. No.	Stratum Code	Agro Climatic Zone	List of Districts
1	101	Lower Brahmaputra Valley Zone	Kokrajhar, Dhubri, Goalpara, Chirang, Bongaigaon, Barpeta, Baksa, Nalbari, Kamrup (Rural) & Kamrup (Metro)
2	201	Central Brahmaputra Valley Zone	Morigaon & Nagaon
3	301	Upper Brahmaputra Valley Zone	Golaghat, Jorhat, Sivasagar, Dibrugarh & Tinsukia
4	401	North Bank Plains Zone	Darrang, Sonitpur, Lakhimpur, Dhemaji & Udalguri
5	501	Barak Valley Zone	Cachar, Karimganj & Hailakandi
6	601	Hills Zone	East Karbi Anglong, West Karbi Anglong & N.C Hills

Source: Rashtriya Krishi Vikas Yojana (RKVY), Dept. Agriculture, Govt. of Assam

Due to its terrain & insurgency issues, the hills zone has been excluded from the survey.

1.9.2.2 First Stage Unit (FSU) Sampling- Selection of Districts

The first stage of the sampling is to select large primary sampling unit, that is, districts. From each stratum a sample of minimum 30% districts have been selected using random sampling method. The selected districts and the respective stratum are given in Table 5. The selected districts are shown in Image 2.

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[15]Flood, cropping pattern choice and returns in agriculture: A study of Assam plains, India,

Stratum	Agro Climatic Zone	Districts Name
101	Lower Brahmaputra Valley	Barpeta
		Dhubri
		Kamrup (Rural)
201	Central Brahmaputra Valley Zone	Morigaon
301	Upper Brahmaputra Valley Zone	Dibrugarh
		Jorhat
401	North Bank Plain Zone	Lakhimpur
		Sonitpur
501	Barak Valley Zone	Cachar
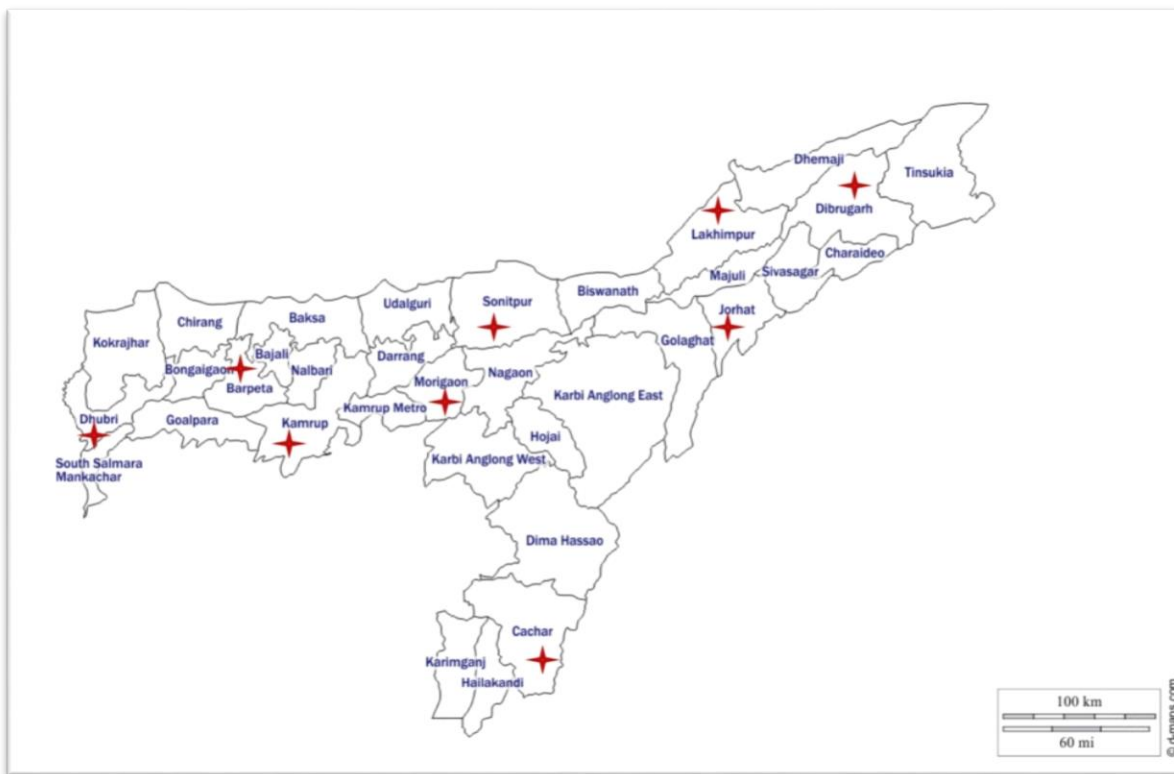
Image 2: Map of Assam with sampled districts

1.9.2.3 Stratum -Sample Size Allocation

The total number of household sample size of 845 has been allocated to five strata using the method of proportional allocation. Hence the sample size for each stratum was kept proportional to the size of the strata. For this purpose, the size of each stratum has been taken as per the respective districts' household data as per Census 2011. If P_i represents the proportion of household included in stratum i, and n represents the total sample size, the number of elements selected from stratum I is $n*P_i$

To illustrate it, for sample size n=845 to be drawn from a population of size N= 2738629 (total household data as per census 2011 for 9 sampled districts) which is divided into 5 strata (excluding hills zone) of sizes N_{101}= 1063717, N_{201}= 184602, N_{301}= 513129, N_{401}= 597226 and N_{501}= 379955 respectively. Adopting proportional allocation, the sample size for stratum 101 would be as follows:

N_{101}=1063717,

P_{101}= 1063717÷2738629=0.39 and

n_{101}=n*P_{101}=845*0.39= 328

Accordingly, the sample size for each stratum has been arrived at by using the proportional allocation method. The stratum wise sample size for each stratum is given under Table 6.

Table 6: Stratum wise distribution of sample size

Stratum Code	Selected Districts	Household Data (as per census 2011)	Stratum Sample Size
101	Barpeta	337929	328
	Dhubri	414674	
	Kamrup(R)	311114	
	Sub-Total	**1063717**	
201	Morigaon	184602	58
	Sub-Total	**184602**	
301	Dibrugarh	276867	158
	Jorhat	236262	
	Sub-Total	**513129**	
401	Lakhimpur	204307	184
	Sonitpur	392919	
	Sub-Total	**597226**	
501	Cachar	379955	117
	Sub-Total	**379955**	
TOTAL		**2738629**	**845**

Source: Statistical Handbook Assam, 2019

1.9.2.4 District wise Allocation of Sample Size

Using the method of proportional allocation, the sample size of each stratum was further distributed among the selected districts based on the proportion of households as per census 2011 data. Table 7 provides the district sample size of household survey.

Table 7: District Wise allocation of sample size

Stratum Code	Selected Districts	Household Data *(as per census 2011)*	Stratum Sample Size	Percent of households	Number of sample households
101	Barpeta	337929	328	32%	**104**
	Dhubri	414674		39%	**128**
	Kamrup(R)	311114		29%	**96**
201	Morigaon	184602	58	100%	**58**
301	Dibrugarh	276867	158	54%	**85**
	Jorhat	236262		46%	**73**
401	Lakhimpur	204307	184	34%	**63**
	Sonitpur	392919		66%	**121**
501	Cachar	379955	117	100%	**117**
TOTAL		**2738629**	**845**		**845**

Source: Statistical Handbook Assam, 2019

1.9.2.5 Second Stage Units Sampling: Selection of Villages and Towns

The district wise sample size has further been segregated into rural and urban sectors using proportion of Census 2011 data. The district sample size has been divided into rural and urban areas as per the proportions of rural and urban household census data. The requisite number of sample villages and towns has been selected using Simple Random Sampling without Replacement (SRSWOR) method. Table 8 provides the breakup of district wise sample size of rural and urban households.

Table 8: District wise distribution of household sample size

Districts	Sample Size	Rural Household		Urban Household	
		Percent	Units	Percent	Units
Barpeta	104	98%	102	2%	2
Dhubri	128	97%	124	3%	4
Kamrup(R)	96	92%	88	8%	8
Morigaon	58	95%	55	5%	3
Dibrugarh	85	93%	79	7%	6
Jorhat	73	89%	65	11%	8
Lakhimpur	63	94%	59	6%	4
Sonitpur	121	97%	117	3%	4
Cachar	117	92%	108	8%	9
Total	**845**		**798**		**47**

Source: Statistical Handbook Assam, 2019

1.9.2.6 Ultimate Stage Unit (USU) - Selection of Households

The Ultimate Stage Units (USU) were the fishing households. In absence of any prior/ secondary data of fishing households, the 1st task for the enumerator is to identify those household who does some kind of fishing at least once a year. For the purpose of the survey, the element is the household who engaged either commercial, artisanal or subsistence fishing in past one year. The required numbers of households were selected by using the SRSWOR method. In order to remove any biases towards a particular location and to cover a large sample of villages, it has been decided to limit maximum of 25 households in any particular village.

1.10 Enterprise Survey- Sampling Methodology

The enterprise study was based on the analysis of primary data collected by the enumerator through personal interview method from the sampled enterprises/fish farmers. Fish farming in the state is done by the owner of the pond/tanks or the person who has taken the pond/beels/river on lease. Hence, the owner/lease holder was taken as respondent and information was collected by the enumerator directly from the owner/lease holder of the pond/beels/river. An appropriate data collection instrument was designed under the guidance of the Head of ICAR-CIFRI, Guwahati Regional Office and in consultation with the representatives of Directorate of Fisheries, Assam. A training workshop of persons associated with the survey work at the field was also held. The list of enterprises surveyed was prepared by using a mixed sampling method.

1.10.1 Sample Size

The sample size for the enterprise survey was done using the following statistical formula

$$n = \frac{z^2 * p * q}{e^2}$$

Where,

n= Sample Size

z= the value of standard variate at a given confidence level. It is assuming at 1.96 for 95% confidence level

p= sample proportion. It is estimated the value of p=0.5 in which case 'n' will be maximum and the most conservative sample size.

q= 1-p, that is, 0.5

e= Acceptable error. It is estimated at 0.05 which is sample size with 5% margin of error

$$n = \frac{1.96^2 * (.5) * (1 - .5)}{(.05)^2} = \frac{.9604}{.0025} = 384$$

As per the above statistical formula, the minimum sample size required for quantitative survey at 95% confidence level and 5% margin of error is 384. The total sample size of 384 enterprises has been segregated among nine sampled districts using Proportional allocation sampling method.

1.10.2 Outline of Sample Design

A stratified two-stage mixed sampling design with the ultimate sampling units being the fish farmer or fishing enterprise has been adopted under the survey. The first stage units (FSU) are the districts selected for the survey. The ultimate stage units (USU) are the fishing enterprises/ fish farmers.

1.10.2.1 First Stage Units (FSU) Sampling- Selection of District

The formation of strata and selection of districts remain the same as household survey.

1.10.2.2 Stratum wise allocation of Sample Size

The total number of enterprise sample size of 384 has been allocated to five stratums using the method of proportional allocation. For this purpose the size of each stratum has been taken as per the respective districts fish production data[16]. If P_i represents the proportion of fish production included in stratum i, and n represents the total sample size, the number of elements selected from stratum i is $n*P_i$.

For better understanding, the sample size n=384 to be drawn from a population of size N= 160643 (total fish production of 9 selected districts for 2017-18) which is divided into 5 strata of sizes N_{101}= 59788, N_{201}= 21472, N_{301}= 23751, N_{401}= 24602 and N_{501}= 31030 respectively. Adopting proportional allocation, the sample size for stratum 101 would be as follows:

N_{101}=59788,
P_{101}= 59788÷160643=0.37 and
n_{101}=n*P_{101}=384*0.37= 143.

Accordingly, the sample size for each stratum has been arrived at by using the proportional allocation method. The stratum wise sample size for each stratum is given under Table 9.

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[16] Statistical Handbook Assam- 2018

Table 9: Stratum wise distribution of sample size

Stratum Code	Fish Production 2017-18 (in tonne)	Sample Size
101	59788	143
201	21472	51
301	23751	57
401	24602	59
501	31030	74
TOTAL	160643	384

Source: Directorate of Fisheries

1.10.2.3   Ultimate Stage Units (USU) Sampling- Selection of Enterprises

The undulating topography and high rainfall have given rise to vast and varied fisheries resources in the state in the form of rivers, flood-plain wetlands/beels, derelict water bodies/swamp/low-lying areas, ponds etc. Hence the representation of different resources is essential to reflect the true picture. For the purpose of this survey, the consultant has taken into consideration the fish farmers engaged in fishing in natural water bodies as well as man-made fisheries. The ultimate stage units for fishing enterprises/ fish farmers have been selected using a non-probability quota sampling method. The enumerators are provided with fixed quotas in consultation with the respective District Fishery Officials in such a manner that it covers both cultures as well as capture fisheries from the selected nine districts. Using the method of proportional allocation, each stratum sample size was further distributed among the districts as per respective districts fish production. The district wise sample size is given in Table 10.

Table 10: District wise distribution of enterprise sample size

Stratum	Districts Name	Fish Production 2017-18 (in tonne)	Percent	Enterprise Sample Size
101	Barpeta	19762	12%	47
	Kamrup (R)	20922	13%	50
	Dhubri	19104	12%	46
201	Morigaon	21472	13%	51
301	Jorhat	12626	8%	30
	Dibrugarh	11125	7%	27
401	Lakhimpur	12789	8%	31
	Sonitpur	11813	7%	28
501	Cachar	31030	19%	74
		160643	100%	384

Source: Directorate of Fisheries

1.10.3   Reference Period

The reference period for the study has been taken as financial year 2018-2019.

1.10.4   Development of Research Tool

As mentioned above, the research tool (standard schedules) has been prepared for the purpose of the Household survey and Enterprise survey by the project team. For the understanding of the enumerator and the respondents, the Schedules has been translated into local Assamese language and also back translated from Assamese to English language to ensure that no information has been lost due to translation. The research tool has been finalized after incorporating comments from the officials of Directorate of Economics and Statistics (Govt. of Assam), Directorate of Fisheries (Govt. of Assam), feedback received during the field staff's observations during the pilot testing.

1.10.5   Field Work and Data Collection

For the purpose of the survey, two enumerators for each constituency were recruited. The field team comprises 18 enumerators & 4 field supervisors for the survey. All the enumerators could read, write and speak Hindi and local language. They had prior experience in conducting surveys. To administer the field progress, supervisors have been assigned districts. The supervisor was responsible for scrutiny of all interviews and ensured data was collected as per the highest quality norms.

1.10.6   Data Processing and Quality Control

After the field work was complete, the data entry was conducted by experience operator under the supervision of the Project Coordinator. All the data was coded, punched, cleaned and validated before it was handed over to the project coordinator, who has done the analysis. The raw data was stored in excel format that was converted to SPSS format.

Each team of enumerators was led by a supervisor who supervised the fieldwork for his team. Quality checks like accompaniments and random checks were conducted by the supervisor in his respective constituencies. All Schedules were scrutinized at a regular interval of 7-10 days.

1.10.7   Ethical Consideration

The following ethical considerations were put in place during the survey. These considerations were also briefed in detail during the training of the enumerators.

- *Informed consent-* The study warranted free and fair executions of respondents' right to know the purpose of the visit by the enumerator. The enumerator informed the respondents the nature and objective of the study.

- *Freedom to terminate the interview and not to respond to questions-* Respondents were given complete freedom to not to respond or to terminate the interview at any point in the course

of the data collection. The purpose of the study was explained to respondents and opportunity was given for non-participation in case the respondent does not feel comfortable.

▪ *Privacy and confidentiality*- Interviews were conducted in a safe setting and respondents of the interview were informed about that though their name will never be disclosed, the information will be shared with others.

▪ *Respect and dignity of the respondents*- The enumerators and supervisors were strictly asked to respect the rights and dignity of all participants. The respondents were treated as being engaged in a process, rather than being treated as mere information givers. Gender roles, religious and cultural factors were kept in perspective in conducting the field work.

1.10.8   Limitation of the Study

Initially the survey was planned to cover households only to estimate the consumption of subsistence fishing. Accordingly, the household data collection instrument has been prepared and field work started from July 2019 onwards. Subsequently, as per the Directorate of Economics and Statistics (Govt. of Assam) advisory committee's recommendation, the enterprise survey has been incorporated into the study from the month of October 2019. Consequently, the household sample size has been revised and enterprise survey sample size and data collection instrument was developed by November 2019. However due to political unrest in the state because of the implementation of Citizen Amendment Act in the country, the data collection for enterprise survey could not be started till January 2020. The pilot testing for the enterprise survey has been done in the month of February 2020 in the state of Morigaon, Kamrup- Rural, and North Lakhimpur. The enterprise survey further got delayed due to the onset of COVID 19 pandemic and subsequent lock down. Finally, the survey has been started from September 2020 onwards and completed successfully.

Image 3: Field survey & joint survey with fishery dept. officials

Chapter 2. Household Survey

The objective of this chapter is to present a profile of the respondents according to the nature of fishing in terms of commercial, subsistence and artisanal fisher. The household survey analyses the frequency and quantity of monthly consumption of fish by the different fisherman households. This chapter also discover frequency of fishing in a month by the household, average time spent on fishing, quantity and earning from sale of fish by commercial and artisanal fisher households, type of craft and gear used by the households, place of fishing, suitable season of fishing and finally average monthly catch and price of different species of fish.

The findings of the socio-economic demographic analysis are presented below.

2.1 Fish Consumption

This section shall cover different types of fisher households as per their nature and purpose of fishing, average number of members permanently living in the households, primary occupation of the households, frequency in terms of number of times in a month the household consume fish, average monthly requirement (in Kilograms) of fish and proportion of own catch and procurement from outside/ market of the total monthly requirement. This will help in estimating the annual per capita consumption of fish by those households who engaged in fishing. It also gives a perspective about the fish consumption pattern of the household in different districts.

2.1.1 Fishing by households

The data for present study has been collected from those households who involved in fishing at least once in past one year. Table 11 shows that 100% respondents have done fishing at least once.

Table 11: Fishing by households

Household involve in Fishing	Frequency	Percent
Yes	845	100%

2.1.2 Type of Fishermen Household

Based on the primary occupation of the household and trading of fish products, the households have been categorized into three parts namely, commercial, subsistence, and artisanal fisherman. Any household whose primary occupation is fishing are considered as commercial fisher household. A household is considered subsistence fisher who does fishing for their own consumption and does not sell any part for profit. Finally, any household who does fishing for its own consumption and also sells a part for profit is considered as artisanal fisher. The various types of fisher based on the below mentioned categorization is shown in Table 12

Type of Fisher	Number of surveyed households	Percent
Commercial	212	25.1%
Subsistence	465	55.0%
Artisanal	168	19.9%
Total	**845**	**100.0 %**

Source: Household Survey

2.1.2.1 District wise Fishermen Households

Table 13 & Figure 1 below depict the district wise segregation of different types of fisher household respondents. Table 13 shows that the district of Morigaon (50%) has the highest number of commercial fishermen household respondents followed by Cachar (47%), Jorhat (32.9%), Sonitpur (24%), Dhubri (22.7%), Barpeta (22.1%), Dibrugarh (12.9%), Kamrup-Rural (9.4%), and Lakhimpur (4.8%) respectively. Among the subsistence fisher household, who does fishing for their own consumption only, the district of Dibrugarh (71.8%) has the highest number of respondents followed by the districts of Kamrup-Rural (69.8%), Barpeta (70.2%), Dhubri (64.1%), Sonitpur (57.9%), Jorhat (50.7%), Lakhimpur (41.3%), Cachar (31.6%) and Morigaon (20.7%) respectively. The artisanal fisher household respondents who sell part of their catch for profit, the district of Lakhimpur (54%) has the highest percentage of respondents followed by Morigaon (29.3%), Cachar (21.4%), Kamrup-Rural (20.8%), Sonitpur (18.2%), Jorhat (16.4%), Dibrugarh (15.3%), Dhubri (13.3%) and Barpeta (7.7%) respectively.

Table 13: District wise fishermen household

	Commercial	Subsistence	Artisanal
Barpeta	22.1%	70.2%	7.7%
Cachar	47.0%	31.6%	21.4%
Dhubri	22.7%	64.1%	13.3%
Dibrugarh	12.9%	71.8%	15.3%
Jorhat	32.9%	50.7%	16.4%
Kamrup Rural	9.4%	69.8%	20.8%
Lakhimpur	4.8%	41.3%	54.0%
Morigaon	50.0%	20.7%	29.3%
Sonitpur	24.0%	57.9%	18.2%
Average	**25.1%**	**55.0%**	**19.9%**

Source: Household Survey

Figure 1: District wise distribution of fishermen household
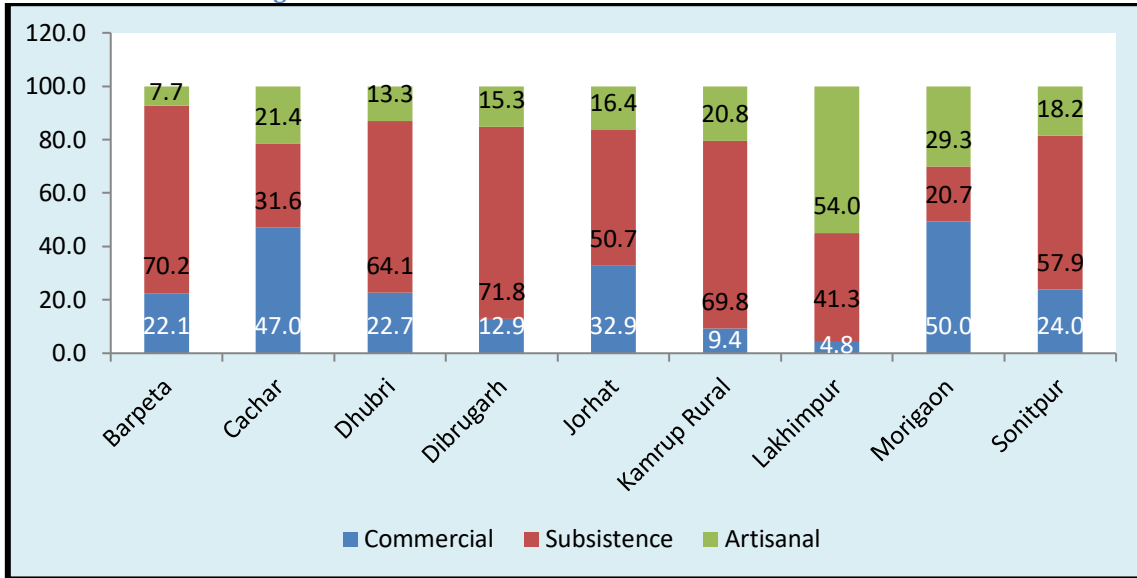
2.1.3 Members permanently living in the households

As per census 2011, the population of the state stands at 3, 12, 05,576 (Three crores twelve lacs five thousand five hundred seventy-six only) and total number of households was 64, 06,471 (Sixty-four lacs six thousand four hundred seventy-one only). By dividing the population by number of households, the average members per household comes at 4.87. Since the consumption of fish per household is directly proportional to the number of members in the household. The consultant has decided to figure out the average members per household through the survey. Figure 2 shows district wise average persons living in the household. The mean has been calculated using the formula:

$$\overline{x} = \frac{\sum x}{n}$$

Where, x= Number of members in the family & n= sample size

Table 14 provides the average number of members in the household of different types of fishermen. The number of members in the family of commercial fisherman is 5.42, subsistence fisherman 5.18 and an artisanal fisherman is 5.70. On aggregate level average members per household is 5.34 with standard deviation of 1.94 members.

Table 14: Fishermen wise members in the family

Type of Fisher	Mean	Frequency	Std. Dev.
Commercial	5.42	212	1.74
Subsistence	5.18	465	2.02
Artisanal	5.70	168	1.89
Total	5.34	845	1.94

Source: Household Survey

Figure 2 below provides district wise family members per fishermen household.

Figure 2: District wise average number of members in household
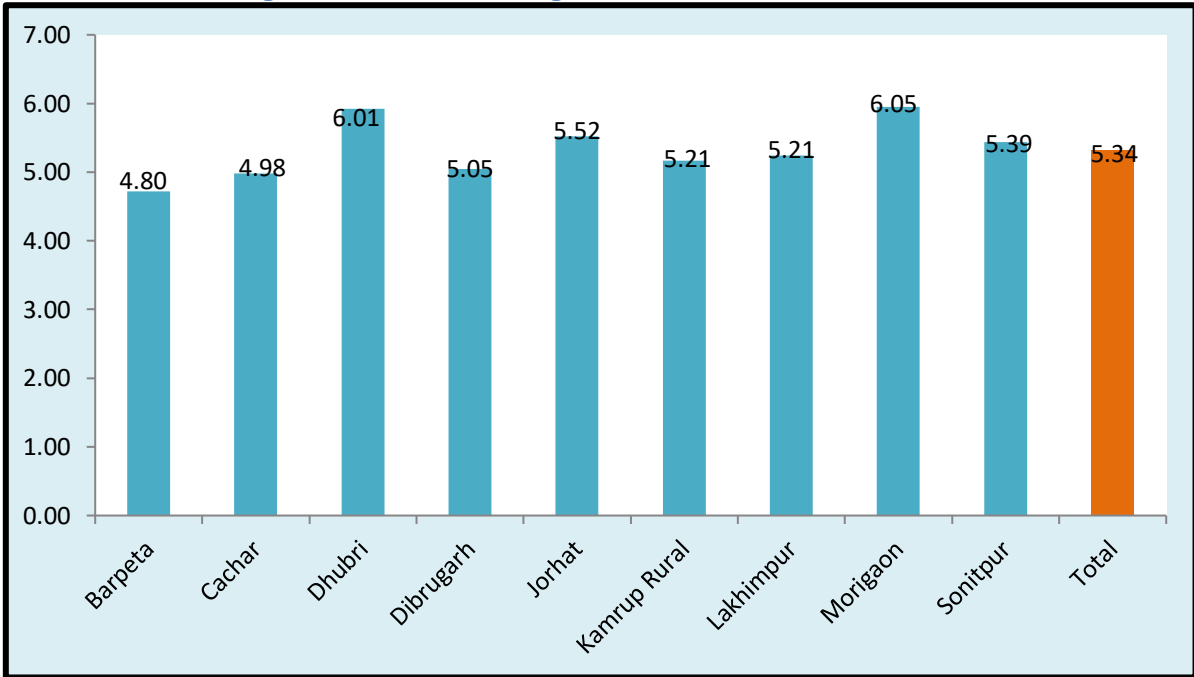
Image 4: Field survey

2.1.4 Source of Income

Figure 3: Primary occupation of household
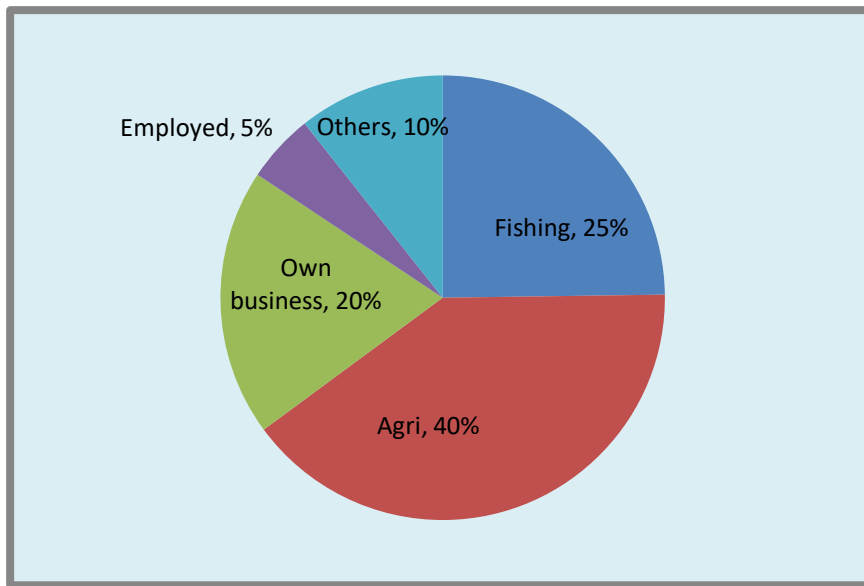
As per survey about 40% of the respondents are dependent on agriculture and animal husbandry related fields, while 25% are dependent exclusively on fishing. Approximately 20% own business or self-employed and only 5% of the respondents are employed in Government or private sector. Around 10% informed that they are engaged in other types of occupation. Figure 3 shows the share of different occupations the households engaged in.

2.1.5 Percentage of Household Members Consume Fish

Figure 4: Percentage of members consume fish in the households
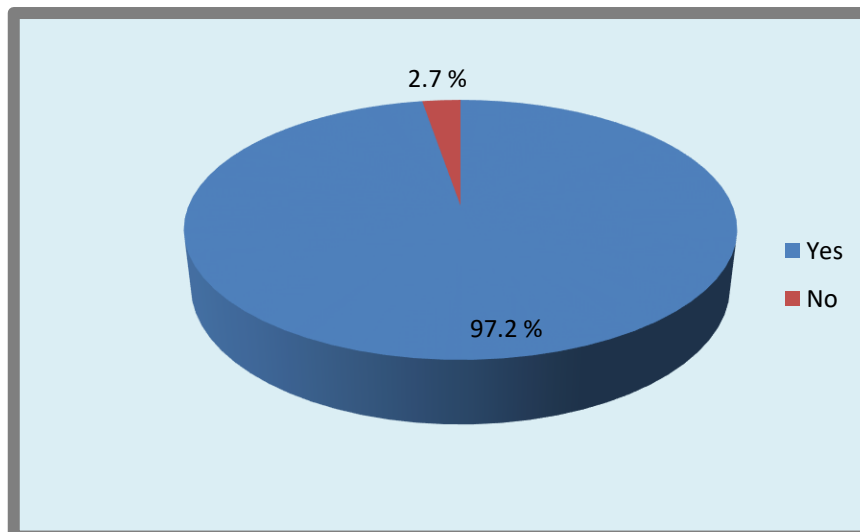
As per Fisheries statistics 2014, about 88.5% of household in Assam eat fish[17]. It has been found during the survey that 97.2% of all members of the household consume fish. Only 2.7% of the household informs that everyone in their family does not eat fish. This data clearly indicates that fish is an important food source for the people of the state. Figure 4 represents the percentage of members consuming fish in households.

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[17] Handbook on Fisheries Statistics 2014

2.1.6 Number of days in a month household consume fish

The respondents were asked about the number of times they consume fish in a month. In order to assess the monthly consumption of fish (in terms of number of days) by the households, each frequency of consumption category has been assigned a factor which has been used to convert the numbers into number of days in a month. Factors of 30, 20, 8, 4, 1 and 0 were used to adjust consumption of fish by the household daily, 4-6 times per week, 1-3 times per week, once per week, Monthly and never categories, respectively.

Based on the above conversion, Figure 5 depicts that 45.4% of the households eat fish 1 to 3 times a week, followed by 41.8% consume 4 to 6 times a week, while 6.7% of the household eat fish almost daily. Only 1.7% of the household informed that they consume fish only 1-2 times a month. Interestingly, the survey has come across 0.1% of the household who do not consume fish due to religious reasons but they do fishing for livelihood.

Figure 5: Number of days in a month household consumes fish
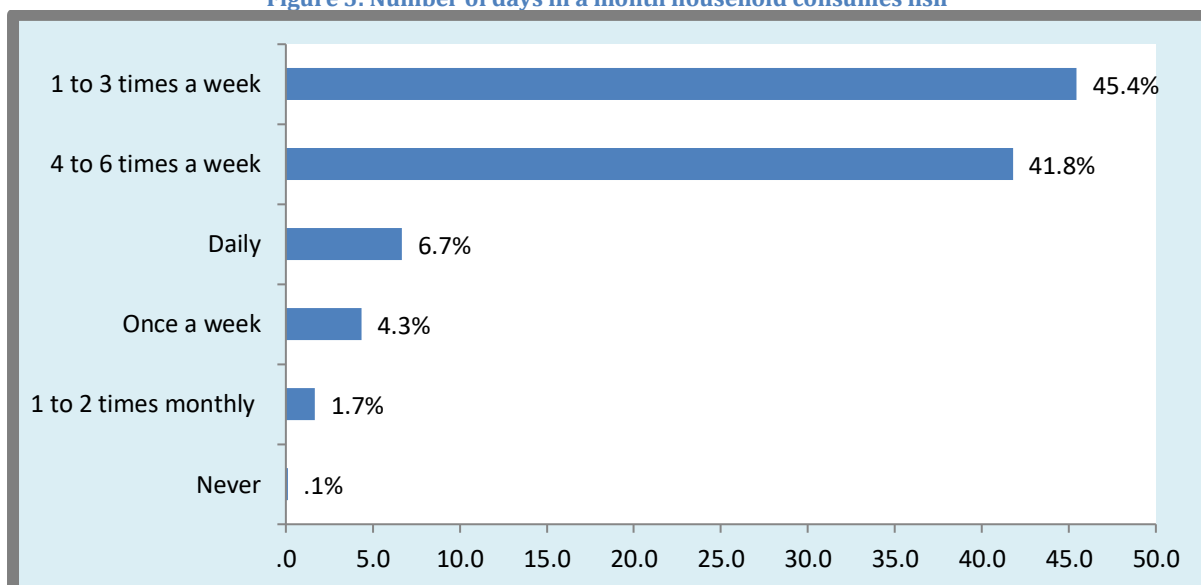
Table 15: District wise consumption of fish per month (no. of days)

Districts	Mean	Observations	Std. Dev.	Min	Max
Barpeta	16.2	104	6.3	4.0	30.0
Cachar	12.8	117	6.3	4.0	30.0
Dhubri	15.2	128	6.7	1.0	30.0
Dibrugarh	12.7	85	7.8	4.0	30.0
Jorhat	9.2	73	6.3	1.0	30.0
Kamrup Rural	13.6	96	6.2	4.0	20.0
Lakhimpur	14.2	63	7.5	0.0	30.0
Morigaon	24.5	58	6.6	8.0	30.0
Sonitpur	12.2	121	7.0	1.0	30.0
Total	**14.2**	**845**	**7.5**	**0.0**	**30.0**

Source: Household Survey

Table 15 presents the district wise consumption of fish by different fisher households in a month. Among the districts, the respondents from Morigaon district (24.5 times /month) reported maximum consumption of fish in a month followed by the district of Barpeta (16.2 times /month), Dhubri (15.2 times /month), Lakhimpur (14.2 times /month), Kamrup Rural (13.6 times /month), Cachar (12.8 times /month), Dibrugarh (12.7 times /month), Sonitpur (12.2 times /month) and Jorhat (9.2 times /month) respectively. The overall standard among districts ranges from 6.2 times/ month to 7.8 times/ month. The overall sample mean of 14.2 indicates that a typical household who involves in some form of fishing consume fish at least 14 days in a month. The aggregate standard deviation of 7.5 from the average indicates the presence of high variations among the households with regard to consumption of fish. The maximum value of 30 shows daily consumption while minimum value 0 with respect to the district of Lakhimpur indicates the household who do not consume fish due to religious reasons but they do fishing for livelihood.

2.1.7 Per capita consumption of fish (in Kgs)

Figure 6 portrays the average monthly quantity of fish consumed by the fisherman household in the sampled districts. Overall, the average fisher household consumes 8.8 kgs of fish per month. Apparently commercial (9.7 Kgs/month) and artisanal (9.3 Kgs/month) fisher households consume more fish than subsistence fisher (8.4 Kgs/month). Based on the above information, the monthly and annual per capita consumption of fish has been calculated and presented on Table 16.

Figure 6: Household consumption of fish
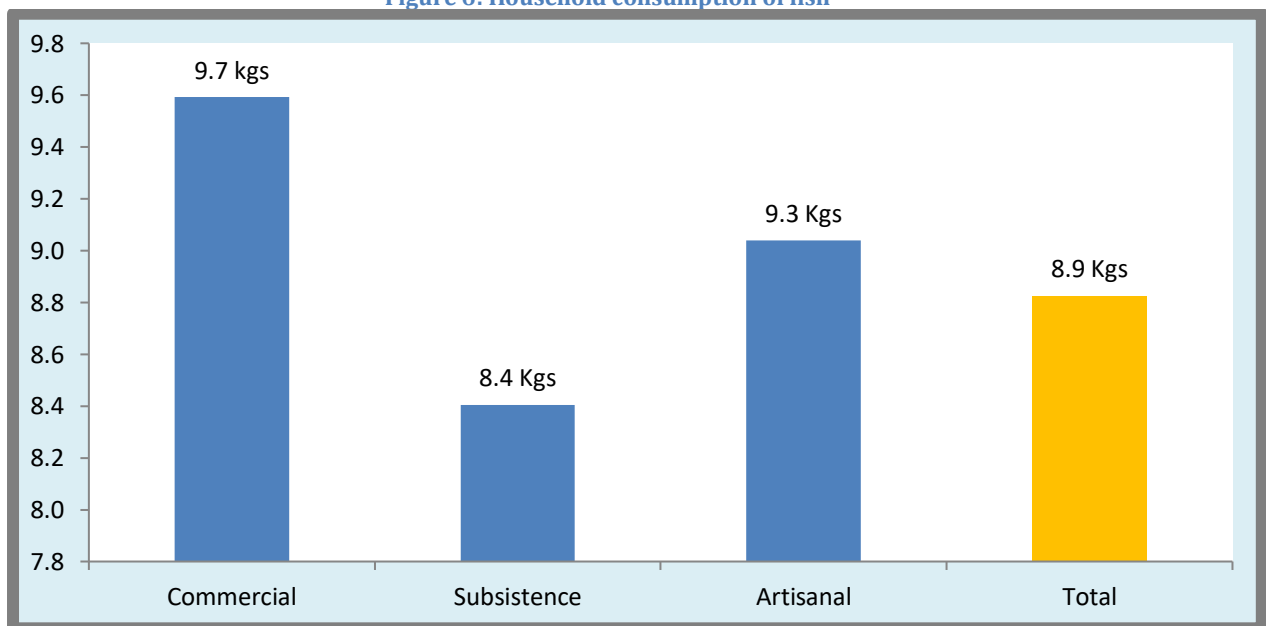
Source: Household Survey

Table 16 presents monthly per capita consumption of fish. As per the calculation based on the data collected through household surveys, the average person consumes approximately 1.67 kgs of fish per month. However, the state per capita consumption of fish is 0.72 kgs per month[18]. As the survey covers only the households involved in fishing, hence the per capita consumption of people involved in fishing is showing higher than the state's average.

<p align="center">Table 16: Monthly per capita consumption</p>

Details	Units
Average monthly consumption of fish by the household	8.9 Kgs
Annual consumption of fish by the household	106.8 Kgs
Average number of members living in the household	5.34 members
Average annual per capita fish consumption *(Annual consumption of fish by the household ÷ Average no. of members living in the household)*	20 kgs
Average monthly per capita fish consumption	1.67 kgs

Source: Household Survey

2.1.8 Sourcing of fish

One of the most critical factors of the study is to calculate the percentage of own catch. In order to estimate the mean percentage of sourcing through own catch, each frequency of effort category has been assigned a factor which has been used to convert the percentage range of catch per month. Factors of 100, 87.5, 62.5, 37.5, 13 and 0 were used to adjust the percentage range of 100% for all, 75% to 99.9974% for maximum, 50% to 74.99% for half or more, 25% to 49.99% for some, 1% to 24.99% for minimum and 0% for none respectively. Table 17 provides the percentage of catches from their own source by different fishermen.

Commercial fishermen households fulfill almost 89% of their monthly requirement from their own catch. The household whose primary occupation is not fishing but they sell a portion of their catch in the market for profit admits to covering 74.1% of their requirement through their own catch and finally the subsistence fisher household inform that they cover 54.94% of their requirement through self-sourcing. Overall fisher households consume approximately 70.49% of their total requirement fish from their own source/catch.

Table 17 provides district wise break up of percentage sourcing of own catch. The commercial household sourced more than 89% of their household requirement from their own source across all the sampled districts except for the district of Jorhat, where the respondents informed, they source 66.2% of their total fish requirement from their own catch. Among the subsistence fisher, respondents from the Cachar sourced more than 68% of their monthly requirements through own catch followed by Barpeta(67.2%), Dhubri(62.8%), Morigaon (62.1%), Lakhimpur (60.7%),

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[18]Handbook on Fisheries Statistics 2018

Sonitpur (58.9%), Kamrup-Rural (45.3%), Jorhat (44.3%) and Dibrugarh (25.1%).

Table 17: Sourcing through own catch by different household

Districts	Commercial	Subsistence	Artisanal	Total
Barpeta	84.70%	67.20%	67.20%	78.00%
Cachar	89.70%	68.10%	84.50%	86.90%
Dhubri	95.10%	62.80%	97.80%	89.30%
Dibrugarh	96.60%	25.10%	70.20%	41.20%
Jorhat	66.20%	44.30%	54.20%	53.10%
Kamrup Rural	94.40%	45.30%	58.70%	52.70%
Lakhimpur	95.80%	60.70%	76.50%	75.00%
Morigaon	94.40%	62.10%	78.70%	86.40%
Sonitpur	87.50%	58.90%	79.50%	71.80%
Overall	**89.38%**	**54.94%**	**74.14%**	**70.49%**

Source: Household Survey

Image 5: Field survey & joint survey with DES officials

2.2 Fishing

This section of the chapter covers the frequency of fishing, portion of total fish sold in the market, earnings from fishing, types of gear and crafts use, place of fishing, different season of fishing and finally types and average quantity of fish catch and their price in the local market.

2.2.1 Fishing Days

The frequency of fishing has a direct impact on the consumption and earnings. In order to arrive at the number of days of fishing, each category has been assigned a factor which has been used to convert into number of days in a month. Factors of 30, 20, 8, 4, 1 and 0 were used for the category daily, 4-6 times per week, 1-3 times per week, once per week, monthly and never respectively.

Figure 7: Number of fishing days in a month
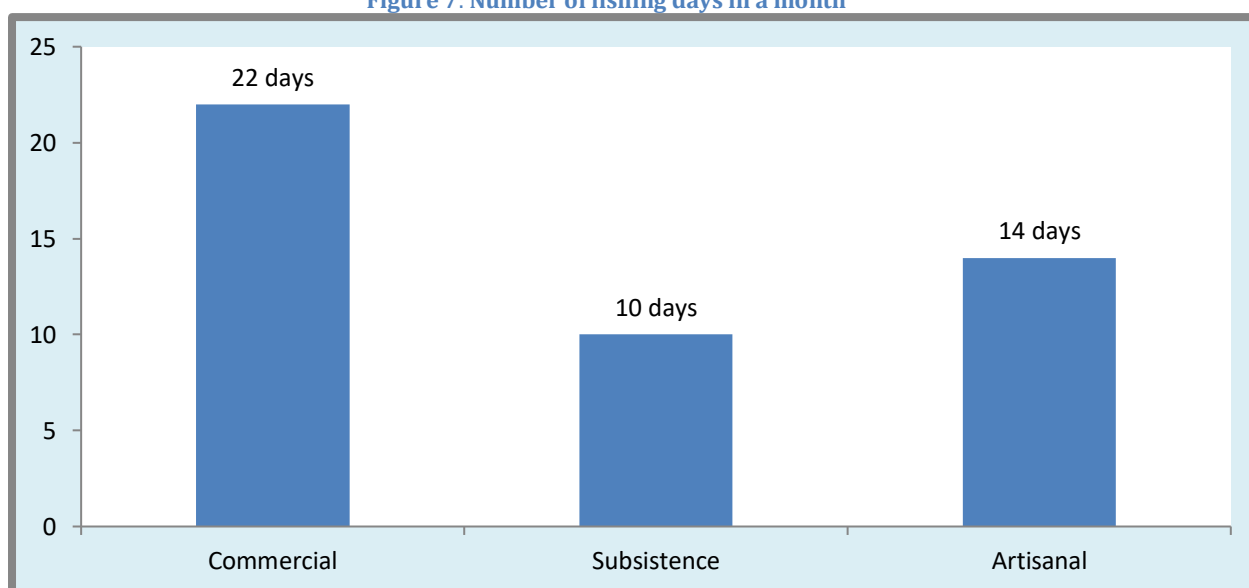
Source: Household Survey

Figure 7 illustrates the frequency in terms of the number of days the fishermen does fishing in a month. It is clear from the above figure that commercial fisher households do approximately 22 days of fishing in a month, followed by artisanal fishermen 14 days and subsistence fisher about 10 days a month.

Table 18 captures the district wise fishing days by different fisherman. Among the Commercial fisherman, Lakhimpur and Morigaon reported 27 days of fishing in a month followed by Dibrugarh (26 days), Dhubri (24 days), Barpeta (21 days), Cachar, Jorhat, Kamrup Rural (20 days) & Sonitpur (19 days). Correspondingly for subsistence fisherman, the number of days of fishing ranges from 6 days to 18 days a month in different districts and for Artisanal fishermen the range is from 4 days to 22 days.

Table 18: District wise average fishing days per month

Districts	Commercial	Subsistence	Artisanal
Barpeta	21 days	11 days	8 days
Cachar	20 days	10 days	11 days
Dhubri	24 days	12 days	19 days
Dibrugarh	26 days	6 days	21 days
Jorhat	20 days	7 days	4 days
Kamrup Rural	20 days	7 days	15 days
Lakhimpur	27 days	18 days	12 days
Morigaon	27 days	10 days	22 days
Sonitpur	19 days	9 days	11 days

Source: Household Survey

Image 6: Meeting with fishery officials & field survey

2.2.2 Fishing Hours

Another important consideration to take into account is the hours spent on fishing by different fishing community. Days and hours spent on fishing are essential to arrive at the man hours engaged in this sector. Similar to the calculation of number of days, factors were assigned to each frequency of hours. Based on these factors, average time spent daily on fishing is calculated.

Table 19: Average hours spent on fishing

Fisherman	Observations	Mean (Hours)	Std. Deviation (Hours)
Commercial	212	4.3	.84
Subsistence	465	1.5	.58
Artisanal	168	2.0	1.28

Source: Household Survey

Figure 8: Fishing hours by fishermen
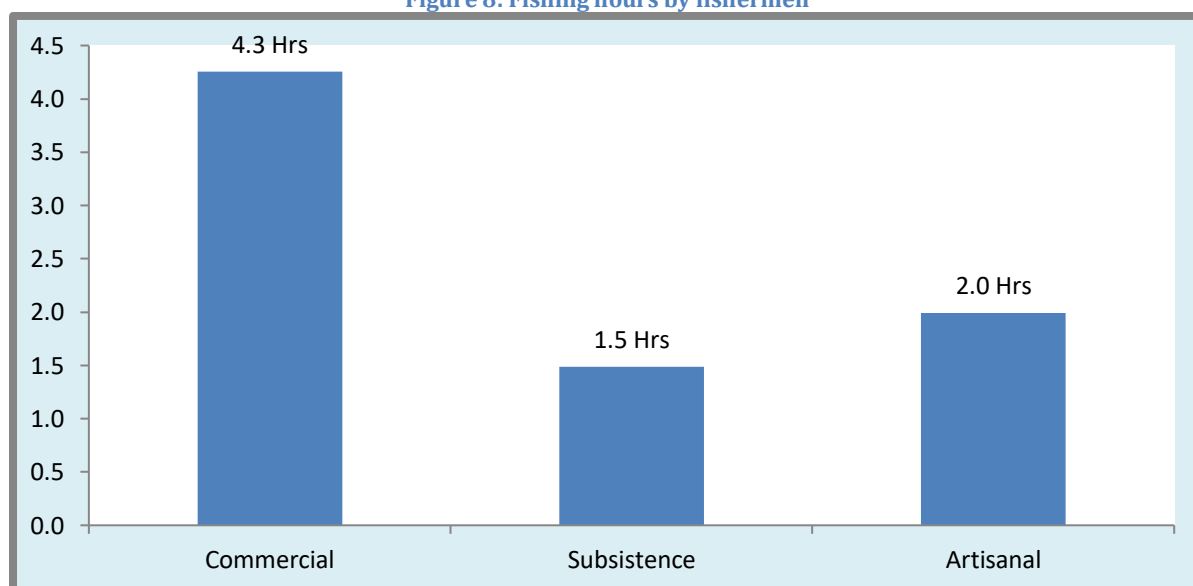
Source: Household Survey

Table 19 & Figure 8 display the average time spent on fishing on any particular day by commercial, subsistence and artisanal fisherman. It is to be noted that commercial fishermen spend about 4.3 hours a day in fishing with standard deviation of 0.84. The subsistence fisherman spends about 1.5 hours on fishing with standard deviation of 0.58, while artisanal fishermen devote about 2 hours a day with standard deviation of 1.28 hours to meet their fish requirement.

2.2.3 Percentage of catch sold by fisherman

It is to be noted that commercial and artisanal fisherman trade in fish for profit and subsistence fishermen use all of its catch for own / family consumption, the survey tries to figure out the percentage of total catch commercial and artisanal fishermen sells in the market. The mean percentage of catch that the fisherman sells in the market has been estimated using factor. Factors

of 100, 87.5, 62.5, 37.5, 12.5 and 0 were used to denote the sell in the market as all, maximum, more than half, less than half, very little and none respectively.

Table 20: Fish sale in the market by various fishermen

Type of fisherman	Mean	Frequency	St. Dev.	Max	Min
Commercial	0.774	212	0.147	1.000	0.375
Subsistence	0.000	465	0.000	0.000	0.000
Artisanal	0.493	168	0.248	0.875	0.125

Source: Household Survey

Table 20 presents mean, number of observations, standard deviation, maximum and minimum values of variable, that is, fish sale by different fisherman in the market. It is evident that the mean, standard deviation, maximum and minimum of subsistence fisherman is showing zero, which implies that they don't sale any fish in the market. The mean of commercial fisherman is showing 0.774 signifying that they sale 77.4 percent of their catch in the market with maximum value of 100 percent and minimum value of 37.5 percent. Standard deviation of 0.147 (14.7 percent), which is not very far from mean indicating that commercial fisherman's sale percentage does not vary significantly. Similarly, artisanal fisherman's average is showing 0.493 implies that 49.3 percent of their catch is sold in the market with maximum of 87.5 percent, minimum of 12.5 percent and standard deviation of 24.8 percent.

2.2.4 Earnings

Over 25 lacs people in the state of Assam are engaged in the fishery sector either as full time, part time or as occasional basis[19]. However, the income levels of the large majority of fishermen and fish farmers engaged in capture and culture fisheries in the state are marginal. Further, fishermen income is subject to seasonality and availability of catch. As per fisheries statistics the average income of fishermen in the country stands at Rs. 4387.78/- per month[19] for the year 2016-17. For the purpose of this study, the consultant has taken into account the income of fishermen for the state of Assam. Table 21 shows the average earning of commercial and artisanal fishermen across nine districts. The overall earnings of the commercial fishermen is Rs. 5598/- per month as compared to Rs. 4022/- for the artisanal fishermen. The overall income for the people engaged in the trade of fishing in Assam stands at Rs. 4810/- per month. The Table 21 shows that commercial fishermen in the district of Lakhimpur earns the maximum (Rs. 7500) followed by Kamrup-rural (Rs. 7000/-), Sonitpur (Rs. 6774/-), Jorhat (Rs. 6250/-), Cachar (Rs. 5658/-), Morigaon (Rs. 5565/-), Barpeta (Rs. 4600/-) and Dhubri (Rs. 3629/-) respectively.

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[19]Handbook of fisheries statistics 2018

Table 21: Earning per month of fishermen household (in Rupees)

Districts	Commercial	Artisanal	Total
Barpeta	4600	3130	3865
Cachar	5658	3300	4479
Dhubri	3629	2500	3065
Dibrugarh	3409	2885	3147
Jorhat	6250	5417	5834
Kamrup Rural	7000	4545	5773
Lakhimpur	7500	2885	5193
Morigaon	5565	4868	5217
Sonitpur	6774	6667	6721
Average	**5598**	**4022**	**4810**

Source: Household Survey

2.2.5 Use of Fishing Gear & Crafts

Since Assam has diverse types of water bodies, each of these water bodies presents different conditions and fish fauna requiring different types of gear to exploit their fish stock[20]. It is estimated that more than ninety varieties of crafts and gears are used for fishing. The consultant has clubbed a variety of crafts and gears used for fishing fewer than seven groups of heads.

Figure 9 and Table 22 shows the types of gears used by different fisher households. It is evident from figure 9 that nets (36.7%) are the most preferred gear used by the entire fisher households. There are a variety of nets used in Assam which includes bag net, hand landing net, gill net, push net, scoop net, seine net, double stick net, lift net, semi-circular purse net etc.

Among the line fishing gears, commercial and artisanal fishermen use different types of line fishing than the subsistence fishermen. About 20% of the household use line fishing. The most common line fishing instruments are line with hooks, hand lines, set lines, drift line, bamboo hook, multiple iron hooks, and hand line, drift long line etc.

Traps are another type of gear which is used extensively in Assam for fishing. Traps are fishing implements wherein fish enters voluntarily but cannot come out. There may be one or more chambers in these traps. Traps accounts for 12.6% respondents.

The fishing craft used by the fishermen of Assam are non- mechanized boats. The boats can broadly be classified into four categories. They are Banana raft, bamboo raft, dug-out canoe and Plank-built boat. The commercial and artisanal fishermen mostly use plank-built boats and dug-

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[20]Fishing crafts and gear of North Eastern India, CIFRI, Barakpore, Kolkata

out canoe, while a very small percentage of subsistence fishermen use bamboo raft and banana raft for fishing.

Wounding gears are the least used fishing gear by the households. Wounding gear includes spears, knife-sickle and arrows and similar weapons.

Among the other types of gear used for fishing are

- Stupefying devices like hammer, explosives etc.
- Aerial Traps such as Mud trench, verandah net.
- Dragged Gear
- Falling Gear such as cover pots

The others category comprised 8.7% respondents.

Figure 9: Overall Use of Gear
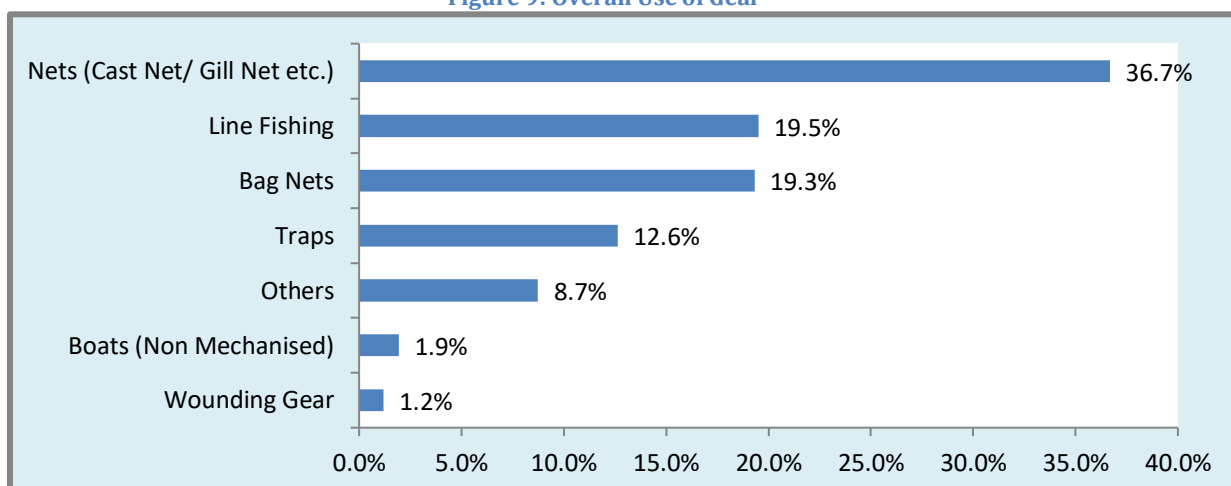
Source: Household Survey

Table 22: Gear and crafts used by fishermen

Gear Used	Commercial	Subsistence	Artisanal
Line Fishing	19.7%	21.6%	17.2%
Nets (Cast Net/ Gill Net etc.)	32.9%	36.2%	40.9%
Wounding Gear	1.4%	1.7%	0.5%
Traps	14.5%	13.4%	10.0%
Bag Nets	20.7%	15.9%	21.3%
Boats (Non-Mechanized)	3.5%	.3%	2.1%
Others	7.3%	10.9%	8.0%

Source: Household Survey

2.2.6 Average Input Cost - Subsistence Fisher

One of the important conventions of calculating GVA under production approach is to deduct the value of various inputs at purchasers' prices which are used in the process of production from the total value of output. Hence it is of utmost importance to estimate the input cost of subsistence fishermen. Table 23 provides the input cost of subsistence fisher across nine sampled districts. The average input cost works out to be Rs. 528.60/- for the subsistence fisher in the state of Assam.

Table 23: Input cost of subsistence fishermen (in Rupees)

Districts	Subsistence fisherman input cost
Barpeta	513.41
Cachar	393.79
Dhubri	466.67
Dibrugarh	621.85
Jorhat	577.62
Kamrup Rural	509.76
Lakhimpur	655.76
Morigaon	550.00
Sonitpur	468.56
Average	**528.60**

Source: Household Survey

2.2.7 Place of Fishing

The undulating topography and high rainfall has given rise to vast and varied fisheries resources in the state of Assam in the form of rivers, flood plain wetlands/beels, derelict water bodies/swamp/low-lying areas, forest fisheries, reservoirs, individual ponds and community ponds. The state of Assam has the maximum number and water area under floodplain wetlands, mainly associated with the rivers Brahmaputra and Barak, locally known as beels. The household study focuses on the varied resources used by the fishermen household of the state. Figure 10 provides the several places of fishing used by different fisher households. At the aggregate level beels and ponds (33% each) are the most preferred place of fishing followed by Rivers (21%), Swaps (10%) and others (3%) respectively.

Table 24 presents district wise water resources used by different types of fishermen. Ponds (33.1%) and Beels (33%) are the most preferred water resources. The district of Lakhimpur (56.7%) and Barpeta's (54.7%) fishermen household uses Ponds extensively for fishing. On the other hand, almost all the sampled districts except for Lakhimpur (9.2%) used beels for fishing.

The respondents from Dhubri (35.3%) reported maximum fishing in Rivers, whereas respondents from Jorhat (9.6%) district reported least fishing in rivers.

Figure 10: Water sources used for fishing
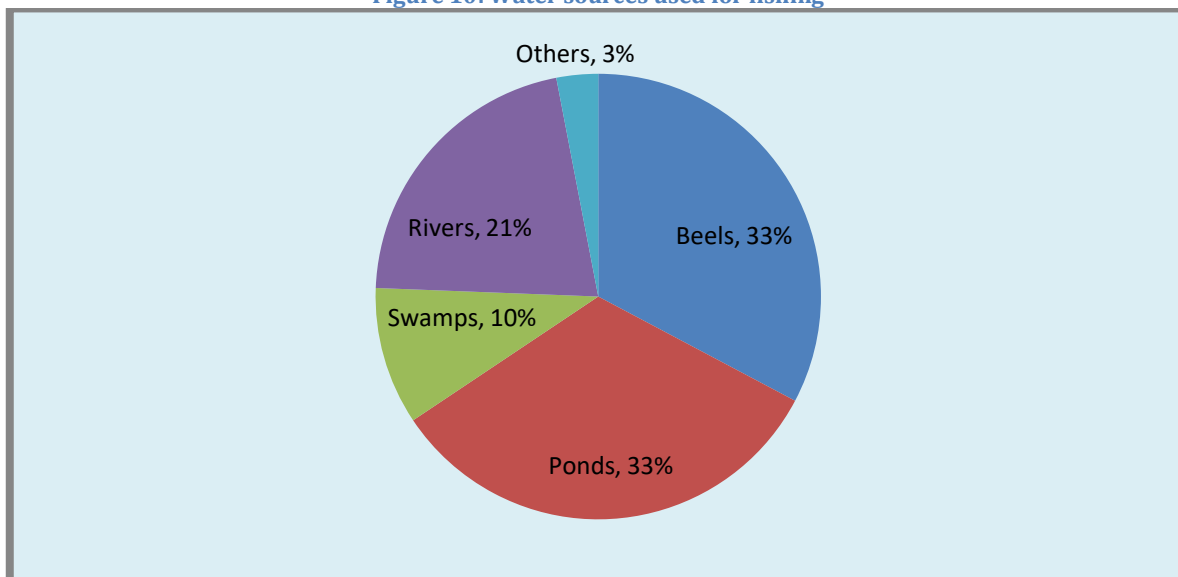
Source: Household Survey

Swamps are water spread areas, which are very shallow, often water saturated covered with weeds, grasses, shrubs and mosses[21].The households of Assam who are not professional fishermen use swamps for fishing. Table 24 projects that swamps are extensively used by the fishermen of Jorhat (25.4%), Morigaon (15.5%), Cachar (13.9%) and Kamrup-Rural (10.9%). Other than the above mentioned four water resources (Beels, Ponds, Swamps and Rivers), rest are clubbed under 'others' category which is very miniscule compared to the rest of four water resources.

Table 24: Use of Water Resources

Districts	Beels	Ponds	Swamps	Rivers	Others	TOTAL
Barpeta	31.0%	54.7%	0.5%	11.3%	2.5%	100.0%
Cachar	37.1%	18.4%	13.9%	24.8%	5.8%	100.0%
Dhubri	43.4%	16.5%	4.8%	35.3%	0.0%	100.0%
Dibrugarh	37.1%	30.5%	8.4%	22.2%	1.8%	100.0%
Jorhat	33.9%	29.9%	25.4%	9.6%	1.1%	100.0%
Kamrup Rural	31.6%	30.5%	10.9%	26.4%	0.6%	100.0%
Lakhimpur	9.2%	56.7%	6.7%	23.3%	4.2%	100.0%
Morigaon	37.8%	23.6%	15.5%	23.0%	0.0%	100.0%
Sonitpur	35.6%	37.1%	4.4%	17.6%	5.4%	100.0%
Average	**33.0%**	**33.1%**	**10.1%**	**21.5%**	**3.0%**	**100.0%**

Source: Household Survey

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[21]Geomorphology explanation of swamps along Brahmaputra River channel, Assam, India (33)

2.2.8 Monthly Average Catch

Table 25 provides the monthly average catch of different species of fish by commercial, artisanal and subsistence fishermen. At the aggregate level, the catch of major carp's species (34%) is the maximum. The major carps are the most preferred farm fishes because of their fast growth and higher acceptability to consumers. Some of the commonly known major carp's species available in the state are Rohu, Bhokua/Catla, Mirka, Grass Carp, Common Carp, and Silver Carp etc. Next to major carps are the live fish species which account for 22% of the total catch by different fishermen. Some of the commonly known live fish available in the state water resources are Magur, Koi, Singi, Goroi, Shal, Shol, Kuchia etc. The respondents of the household survey reported small fish catch to be at 19% of the total fish catch. Few of the common small fish categories available are Moa, Puthi, and Borail etc. Big fish like Aari, Chitol, and Borali etc. come in fourth place with 13% of the total catch share. Last but not the least species are the minor carps which account for 12%. Some of the commonly available minor carp's species are Lachim bhangon, Kurhi, China Puthi etc.

It is to be noted that the subsistence fishers share of catch are maximum for the live fish (31%) and small fish (30%) respectively, while for commercial and artisanal fisher, major carps have the maximum percentage of share at 37% and 33% respectively. Another interesting point to be noted is that big fish account for maximum percentage for commercial fishermen (17%), while for artisanal and subsistence fishermen it is only 6% and 4% respectively.

Table 25: Catch of fish by different fisher households

Type of Species	Commercial	Subsistence	Artisanal
Major Carps	37%	23%	33%
Minor Carps	12%	13%	15%
Live Fish	20%	31%	20%
Small Fish	14%	30%	26%
Big Fish	17%	4%	6%
Total	**100%**	**100%**	**100%**

Source: Household Survey

Image 7: Enumerators training & survey

2.2.9 Average catch by fisherman

In order to assess the ratio of subsistence fishing to total production, it is important to estimate the average production fish by of different fisherman. The details of catch by commercial, artisanal and subsistence fisherman are provided below.

- **Monthly catch by commercial fisherman**

Table 26 provides the district wise number of observations, mean, standard deviation and maximum and minimum values of monthly catch in terms of kilograms for commercial fisherman under household survey.

Table 26: Details of fish catch per month by commercial fisherman (in Kilograms)

Districts	Frequency	Mean	Total Catch	Max	Min
Barpeta	23	57.26	1317.00	73.00	43.00
Cachar	55	77.98	4289.00	375.00	17.00
Dhubri	29	35.31	1024.00	75.00	18.00
Dibrugarh	11	35.72	393.00	52.00	22.00
Jorhat	24	60.62	1455.00	145.00	28.00
Kamrup Rural	9	27.44	247.00	80.00	20.00
Lakhimpur	3	58.33	175.00	74.00	29.00
Morigaon	29	49.03	1422.00	125.00	20.00
Sonitpur	29	61.00	1769.00	110.00	21.00
Total	**212**		**12091.00**		

Source: Household Survey

The average catch of fish per month by commercial fisherman has been calculated by using the below formula

$$\bar{x} = \frac{\sum x}{n} = \frac{12091}{212} = 57.03 \text{ Kgs}$$

Where, $\bar{x}$= mean catch of monthly fish in kilograms by commercial fisherman

$\sum x$= sum of total catch by commercial fishermen in nine sample districts &

n= sample size of commercial fisherman during the household survey.

Hence, the average catch by commercial fisherman per month is 57.03 Kgs. In terms of district wise mean catch, Cachar reported maximum with 77.98 Kgs while Kamrup rural reported lowest of 27.44 Kgs. The district of Cachar has reported maximum value (375 Kgs) as well as minimum values (17 Kgs), which indicated the sample of cachar district includes both large as well as small commercial fisherman.

- **Monthly catch by subsistence fisherman**

Table 27 present the district wise monthly catch of fish reported by subsistence fisher households.

Table 27: Details of fish catch per month by subsistence fisherman (in Kilograms)

Districts	Frequency	Mean	Total Catch	Max	Min
Barpeta	73	8.1	591.3	17	4
Cachar	37	14.0	518.0	34	6
Dhubri	82	6.3	516.6	18	4
Dibrugarh	61	5.6	341.6	14	4.8
Jorhat	37	3.8	140.6	11	1
Kamrup Rural	67	5.6	375.2	16	2
Lakhimpur	26	6.1	158.6	13	2
Morigaon	12	9.6	115.2	16	4
Sonitpur	70	5.4	378.0	16	1
Total	**465**		**3135.1**		

Source: Household Survey

As per the above table, the average catch per month by subsistence fisherman is

$$\bar{x} = \frac{\sum x}{n} = \frac{3135.1}{465} = 6.74 \text{ Kgs}$$

Hence, the mean catch by subsistence fisherman is 6.74 kgs per month with highest reported by Cachar (14 Kgs) followed by Morigaon (9.6 Kgs), Barpeta (8.1 Kgs), Dhubri (6.3 Kgs), Lakhimpur (6.1 Kgs), Dibrugarh & Kamrup-Rural (5.6 Kgs each), Sonitpur (5.4 Kgs) and Jorhat (3.8 Kgs) respectively. The maximum catch among the districts ranges from 11 kgs to 34 kgs, while minimum is from 1 kg to 6 kgs respectively.

- **Monthly catch by artisanal fisherman**

Table 28: Details of fish catch per month by artisanal fisherman (in Kilograms)

Districts	Frequency	Mean	Total Catch	Max	Min
Barpeta	8	7.50	60.00	13.00	5.00
Cachar	25	17.38	434.50	46.00	4.00
Dhubri	17	17.41	296.00	27.00	10.00
Dibrugarh	13	12.65	164.50	20.00	5.50
Jorhat	12	16.37	196.50	32.00	5.00
Kamrup Rural	20	18.20	364.00	50.00	8.00
Lakhimpur	34	14.23	484.00	40.00	8.00
Morigaon	16	36.68	587.00	75.00	20.00
Sonitpur	22	13.13	289.00	27.00	3.00
Total	**167**		**2875.50**		

Source: Household Survey

As per Table 28 the average catch by artisanal fisherman is $\bar{x} = \frac{\sum x}{n} = \frac{2875.5}{167} = 17.22$ Kgs per month. The maximum value reported by Morigaon district (75 kgs), while minimum catch is from Sonitpur district (3 Kgs).
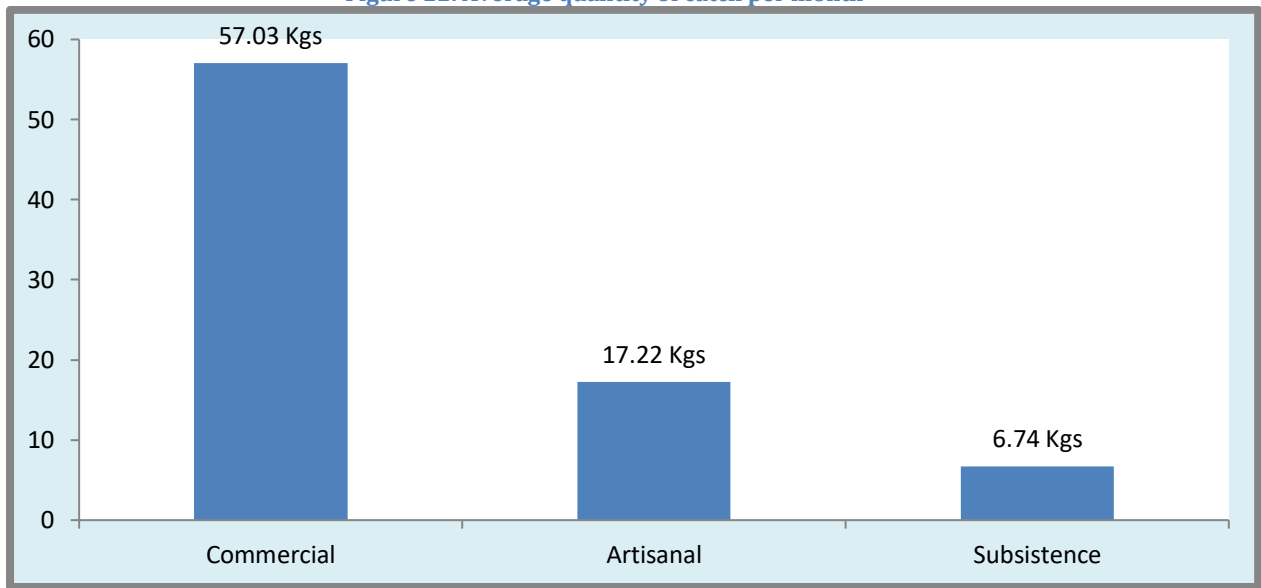
Thus, on an aggregate level as per figure 11commercial fisherman catch about 57 kgs of fish per month, artisanal fisherman 17.21 kgs and subsistence fisherman 6.74 kgs per month respectively.

Image 8: Field survey

2.2.10   Average Rate of Fish

To arrive at the ratio of subsistence fishing to total production in terms of value, it is essential to find out the average price of the fish. The survey finds out the retail price of different categories of fish across nine districts. The average prices of all categories of fish from nine districts were collated to arrive at the mean retail rates of fish. Figure 12 presents the average rates per kilogram. It is found that big categories of fishes (Rs. 370/- per kgs) are most costly compared to other categories. Next to big fish are the live fish categories which cost average Rs. 323/- per kg. The major carp's categories of fish, widely captured and cultivated by the fishermen cost Rs.228/- per Kg. The minor carp categories of fish cost average Rs. 186/- per kg and finally the widely available small fish categories cost the least Rs.155/- per kg.

Figure 12: Rate of fish per kg (in Rupees)
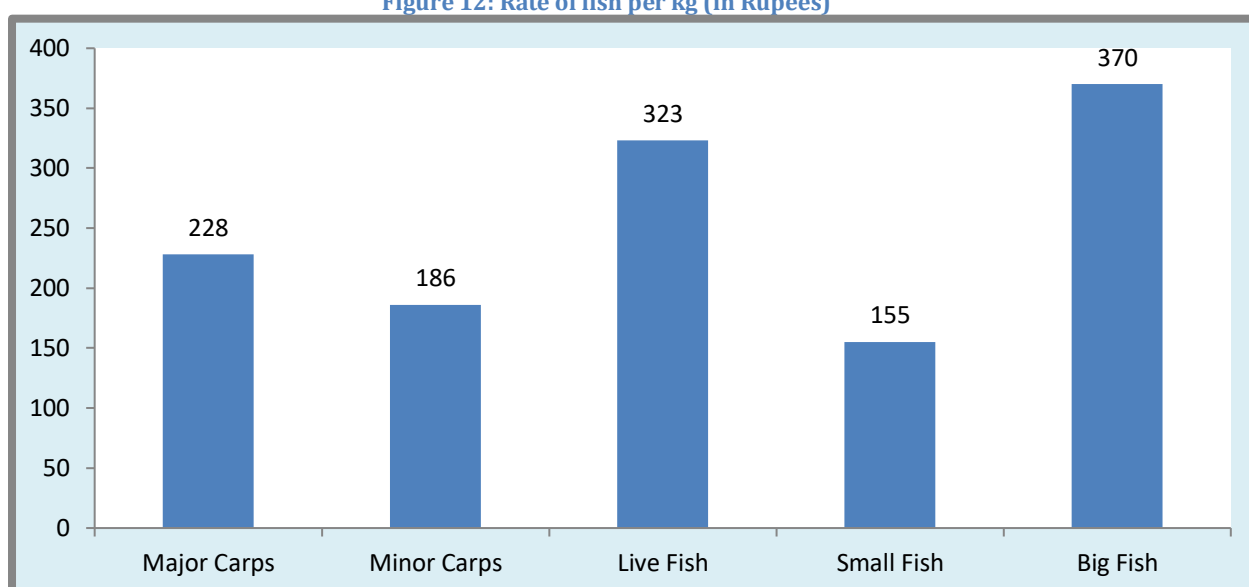
Source: Household Survey

Table 29: District-wise rates of different species of fish (in Rupees)

Districts	Major Carps	Minor Carps	Live Fish	Small Fish	Big Fish	Average
Barpeta	178	143	291	133	370	223
Cachar	273	144	395	199	400	282
Dhubri	256	183	284	122	378	244
Dibrugarh	242	312	381	234	396	313
Jorhat	231	173	245	162	276	217
Kamrup Rural	210	193	300	129	406	248
Lakhimpur	212	194	385	111	350	250
Morigaon	214	254	300	226	293	257
Sonitpur	229	174	329	127	350	242
Average	**228**	**186**	**323**	**155**	**370**	**252**

Source: Household Survey

Table 29 presents district wise retail rates of different species of fish sold in the market. The major carp's category of fish which mainly includes Rohu, Bhokua/Catla, Mirka, Grass Carp, Common Carp, Silver Carp etc. are the most common fish caught by all the fishermen across the state. The average price of this category of fish is Rs. 228/-, however the rates vary from district to district. The district of Cachar reported the maximum at Rs. 273/- per kg while the district of Barpeta reported least at Rs. 178/- per kg for Major Carps. Similarly for minor carps categories of fish the rates across the districts vary from Rs. 143/- per kg to Rs. 312/- per Kg. The Live fish categories rates ranges from Rs. 245/- to Rs. 395/- per kg. The small categories of fish, mostly consumed by subsistence fishermen and popular among the indigenous people of the state, the price ranges from Rs.111/- per kg to Rs. 234/- per kg. Last but not the list, the big fish categories are the most expensive ones and their rate per kg varies from Rs. 276/- to Rs. 406/- in various places of the state. Overall, the average per kg rate of fish in Assam as per the survey stands at Rs. 252/-.

Image 9: Field survey & meeting with DES officials

2.3 Conclusion

This chapter has presented the outcome of the household survey of the respondents of nine districts of Assam viz, Barpeta, Cachar, Dhubri, Dibrugarh, Jorhat, Kamrup-Rural, Lakhimpur, Morigaon and Sonitpur. The main conclusions from the household survey are as follows:

- Out of total 845 respondents in the household survey, 55% households engaged in subsistence fishing implies that they do fishing for households' consumption and do not sell any part to earn money. 20% of the respondents are artisanal fishermen or part time fishermen whose primary job is not fishing but they do sell fish in the market for profit and finally 25% respondents are full time commercial fishermen whose primary job is fishing.

- The average numbers of members permanently living in the household are 5.3 members

- 40% of the respondents during the survey informed their primary occupation as agriculture and allied activities, 25% of the respondents exclusively engaged in fishing, 20% are self-employed with their own business, 5% of the respondents are employed in various sectors and 10% of respondents are outside the above categories.

- About 97% of the respondents household consume fish

- 45% of the respondents informed that they consume fish 1 to 3 times a week, around 42% of the household eat fish 4 to 6 times a week, 6.7% of the household informed that they consume fish daily, 4.3% eat once a week, 1.7% eat once or twice a month and only 0.1% of the household informed that they do not consume fish due to religious reasons but they do fishing for livelihood.

- Commercial fisher households consume approximately 9.7 kgs of fish per month followed by artisanal/part time fisher household 9.3 Kgs and subsistence family members consume about 8.4 kgs of fish per month.

- The full-time fishermen household fulfill 89% of their monthly fish requirement through own catch. Subsistence fisher household sources approximately 55% and artisanal fishermen households sourced around 74% of their requirement through self-fishing.

- Commercial fishermen do fishing about 22 days a month. While artisanal fishermen do about 14 days and subsistence households do approximately 10 days of fishing.

- The average hours spent by different fishermen on any particular day on fishing are commercial 4.3 hours, artisanal 2 hours and subsistence 1.5 hours.

- The commercial fisher household sells approximately 77% of their catch in the market and artisanal fishermen sell around half of their catch which is 49.3%

- The average earnings of commercial fisher households is Rs. 5598/- per month, while for artisanal households it is Rs. 4022/- per month.

- Nets (37%) are the most common gear used by the entire fishermen household followed by line fishing (20%), bag nets (19%), traps (13%), boats (2%) and wounding gear (1%). Gears other than the mentioned above are 9%

- The survey also calculated the input or intermediate cost for subsistence fishing which is Rs. 529/-

- Among the vast water resources available in the state, Beels (33%) and Ponds (33%) are the most preferred places of fishing followed by Rivers (21%), Swaps (10%) and others (3%) respectively.

- At the aggregate level, the catch of major carp fish is maximum among commercial fishermen (37%) and artisanal fishermen (33%). The highest percentage of catch among subsistence fishermen are live fish which account for 31% followed by small fish 30%.

- The average monthly quantity of catch are commercial household (57.3 kgs), artisanal household (17.2 kgs) and subsistence fisher household (6.74 Kgs) respectively.

- The household survey reveals the average retail rates of various categories of fish available in the state. The cost of big categories of fishes are Rs. 370/- per kgs followed by live categories of fish at Rs. 323/- per kg, major carps at Rs. 228/- per kg and small categories of fish at Rs 186 per kg.

Image 10: Field survey

Chapter 3.   Enterprise Survey

The objective of this chapter is to find out the nature of commercial fishing. It studies the form of establishment run by the commercial fisherman, type of inland resources used for fishing, output/ production in terms of quantity and value of different species of fish caught and cost of various inputs used for the purpose of commercial fishing. The findings of the enterprise survey are summarized below.

3.1   Type of Establishment

The establishment of the commercial fisherman in terms of ownership is classified as per the classification of the 6th Economic Census 2013, Assam[22]. As per the 6th Economic Census 2013, an establishment can be classified into Government/Public Sector Undertaking (PSU), Private sector establishment, Private Company Limited, Non-Profit Institution (NPI), Proprietary Establishment, Partnership Establishment, Co-operative Society and Self-Help Group (SHG).

- Government/Public Sector Undertaking (PSU): Establishments which are wholly owned or run or managed by Central or State governments, quasi-government institutions, local bodies like Panchayat, Zila Parishad, City Corporation, Municipal authorities etc. those run with more than 50% share of the government are defined as Government/Public Sector Undertaking (PSU).

- Private sector establishment: Establishment owned or managed by a single person or a group of persons with less than or equal to 50% share of the Government or local body is termed as private sector establishment.

- Private Company Limited: Those Companies registered under the Companies Act, 1956 as Private Limited Companies would fall under this category.

- Non-Profit Institution (NPI): Non-profit institutions are legal social entities created for the purpose of producing goods and services whose status does not permit them to be a source of income, profit or other financial gain for the units that establish, control or finance them. In practice, their productive activities are bound to generate either surplus or deficits but the units that establish, control or finance them cannot appropriate surpluses. The articles of association by which they are established are drawn up in such a way that the institutional units which control or manage them are not entitled to a share in any profits or other income which the NPI's receive. For this reason, they are frequently exempted from various kinds of taxes.

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22 6th Economic Census, 2013, Assam

- Proprietary Establishment: An establishment is called proprietary establishment when an individual is the sole owner of the establishment.

- Partnership Establishment: Partnership is defined as the relation between persons who have agreed to share the profits of business carried on by all or any one of them acting for all. There may be two or more owners, belonging to the same or different households, on a partnership basis, with or without formal registration.

- Co-operative Society: A Co-operative society is one that is formed through the co-operation of a number of persons, recognized as members of the society, to benefit themselves. In the process, the funds are raised by members' contribution/investments and the profits generated out of the society's activities are shared by the members. Such societies are usually registered under Co-operative Societies Act, 1912.

- Self Help Group (SHG): SHG is a financial intermediary usually composed of between 10-20 local persons. Members make small regular savings/contributions over a few months until there is enough capital in the group to begin lending. Funds are then blended back to the members or to others in the village for any purpose. Many SGHs are 'linked 'to banks for the delivery of microcredit. SHG need not be registered.

The enterprise survey captured the data related to the type of establishment run by different commercial fishermen. Figure 13 captures the data with regard to the type of establishments. It is clear from the figure that majority of the respondents run their business as proprietary establishments (67%), followed by private sector establishment (23.2%), Self-help group (5.7%) partnership business (2.9%), cooperative societies (1%), and private limited company (0.3%). There were no Government/Public sector undertaking and Non-profit Institutions among the surveyed respondents.

Figure 13: Type of commercial fishing establishments
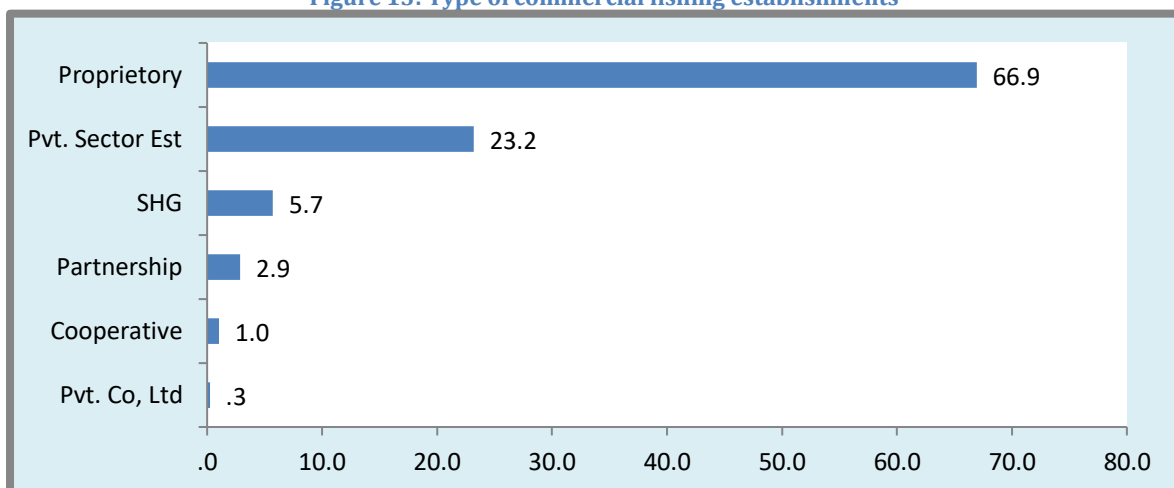
Source: Enterprise Survey

3.2   Use of Inland Water Resources for Fishing

For the purpose of enterprise survey, the water resources used by the commercial fishermen are classified into four categories. They are

- Ponds & Tanks: Man-made fisheries which constitute ponds and tanks are the main source of water resource use by the professional fishermen for fishing. About 87% of the respondents informed use of ponds and tanks for fishing. Table 25 provides district wise ponds and tanks surveyed and their area. As a whole there are 124 ponds surveyed with a total area of 261.86 hectares.

- Beels & Lakes: Floodplain wetlands popularly known as beel are considered to be one of the most potential open water fisheries resources of Assam both in terms of their fish production potential and large resource size. Beels have remained the mainstay of capture fisheries in the state and are a repository of a rich variety of indigenous fish species.

- Rivers: The state of Assam is blessed with Brahmaputra and Barak rivers. These two rivers with their tributaries constitute rich riverine fisheries in Assam. The combined length of 2 main rivers and 53 tributaries is estimated to be 4820 kilometers. The river Brahmaputra flows for 640 kilometers in Assam from Sadiya to Dhubri before it enters Bangladesh. It has 42 important tributaries of which 27 falls under the north bank and 15 are on the south bank. The Barak is a smaller river flowing through southern Assam into Bangladesh joining River Padma. These two river systems harbor a variety of indigenous fish species. Table 28 provides the district wise number riverine fisheries incorporated in the survey

- Others: Any water body other than the mentioned above falls under 'Others' category. They may include swamps, derelict water bodies etc.

Figure 14 captures the inland water resources use by the commercial fishermen during the enterprise survey

Figure 14: Inland Water Resource by commercial fishermen
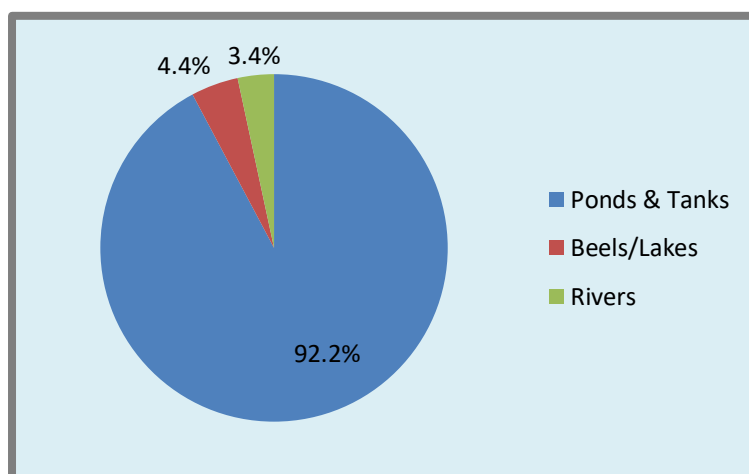
Fish culture in ponds is a deep-rooted tradition in the state of Assam. Majority of the commercial fishermen surveyed confirmed that they do fishing in manmade ponds and tanks. About 92% of the respondents informed of using ponds and tanks for commercial purpose fishing.

Ponds are the most important source of culture fisheries in the state. Around 4.4% of the respondents used beels and lakes for commercial fishing and 3.4% did fishing in rivers.

The district wise number of inland water resources surveyed and their areas are given in Table 30

<div align="center">Table 30: District-wise survey done on Inland Water Resources</div>

Districts	Ponds		Beels		Rivers	
	Numbers	Area (Hectare)	Numbers	Area (Hectare)	Numbers	Area (kilometers)
Barpeta	43	36.7	2	60.08	2	35.0
Cachar	72	44.1			2	19.0
Dhubri	44	31.2	2	40.16	1	15.0
Dibrugarh	22	12.9	3	120.88	2	28.0
Jorhat	26	24.2	3	16.91	2	9.0
Kamrup_R	47	38.4	3	140.00		
Lakhimpur	28	32.0	1	4.00	2	9.0
Morigaon	50	44.0	1	4.02		
Sonitpur	24	16.6	2	11.00	2	10.0
Total	**356**	**280.2**	**17.0**	**397.05**	**13**	**125.0**

Source: Enterprise Survey

Based on the fish production of the districts, the sample size has been distributed. As per Table 25 the maximum number of ponds surveyed was in the district of Cachar (72) followed by Morigaon (50), Kamrup Rural (47), Dhubri (44), Barpeta (43), Lakhimpur (28), Jorhat (26), Sonitpur (24) and Dibrugarh (22) respectively. Similarly, beels were surveyed in all the districts except for Cachar and rivers were also surveyed except for the districts of Kamrup Rural and Morigaon.

<div align="center">Image 11: Enterprise field survey</div>

3.2.1 Different Categories of Fish

The fishes commonly available in the state of Assam were divided into eleven broad categories namely Indian major carps, exotic fish, minor carps, live fish, high value small fish, low value small fish, big catfish, minor catfish, freshwater prawns, dry fish and others respectively. The vernacular name of the fishes along with their scientific name under each category is given below.

- Indian Major Carps: Major carps are the mainstay of freshwater aquaculture. Because of their fast growth and acceptance by the majority of consumers, major carps are the most preferred farmed fish of Assam.

- Exotic Fish: These fish species are of foreign origin and introduced to state to augment fish production.

- Minor Carps: Different types of minor carps species are available in vast water resources of Assam, some of the widely use minor carp fish are given below

- Live Fish: Among the live fish categories, the most prominent ones are given under Table 31

- High value small fish: One of the most popular and readily available fish species in the state are small fish categories. However small fish can further be segregated on the basis of its affordability in terms of high value and low value fish category.

- Low value small fish: These categories of fish are more affordable to common people.

- Big Catfish: The catfish got its name from their prominent barbels, which resemble a cat's whiskers. The inland water of Assam is habitat to some of the big as well as small categories of catfish.

- Minor Catfish: There are quite a number of small catfish available in the state of Assam. The most commonly available are given under Table 31

- Freshwater prawns: Fresh water prawn farming is relatively a new concept for the fish farmers of the state and it is picking up gradually. The state government has also taken a lot of initiative to promote fresh water prawn farming.

- Dry fish: A sizable quantity of fish is being preserved traditionally by way of drying, salting, fermentation and other local specific methods.

- Others: The others category includes all the fishes other than the mentioned above. Some of the most common fish which will fall in this category are given below.

	Common name (Vernacular name)	Scientific Name
Indian Major Carps	Rau/ Rohu	Labeo rohita
	Bhokua/Catla	Catla
	Mirika	Cirrhinus mrigala
	Grass carp	Ctenopharyngodon idella
	Common carp	Cyprinus carpio
	Silver carp	Hypopthalmichthys molitrix
Exotic Fish	Botia	Neoeucirrhichthys maydelli
	Cheniputhi	Systomus sarana
	Rupchanda	Red Bellied Pacu
Minor Carps	Lasim	Cirrhinus reba
	Bata	Labeo bata
	Kurhi	Labeo gonius
Live Fish	Goroi	Channa punctata
	Shol	Channa striata
	Cheng	Channa gachua
	Chengeli	Channa marulius
	Sal	Channa stewartii
	Magur	Clarias batrachus
High Value Small Fish	Karoti	Gudusia chapra
	Moa	Ambiypharyngodon mola
	Boriala	Aspidoparia morar
	Kanduli	Notopterus noptopterus
Low Value Small Fish	Chanda	Chanda nama
	Botia	Neoeucirrhichthys maydelli
	Puthi	Pethia ticto ticto
	Kholihana	Trichogatser fasciata
Big Catfish	Borali	Wallago attu
	Aari	Aorichthyus aor
	Pangas	Pangasius
	Garua	Bagarius bagarius
Minor Catfish	Pabhoh	Ompok pabo
	Tingorah	Mystus tengra
	Singorah	Mystus cavasius
	Ritha	Ritarita
Others	Chital	Chitala chitala
	Kanduli	Notopterus noptopterus
	Ilish	Tenualosa ilisha
	Pithia	Tor tor

3.3 Output/Fish Production

This part of the study specifically covers the quantity of fish caught season wise, average wholesale and retail rate of different categories of fish and production in terms of value.

3.3.1 Seasonal Catch of Fish

The year has been segregated into four seasons for both household and enterprise surveys. They are Pre-monsoon (March, April & May), summer (June, July & August), Post-monsoon (September, October & November) and winter (December, January and February) respectively. Generally, the techniques employed for fishing change with the change in season. Usually during floods fishing is prohibited as it is time for fertilization and migration of fishes into depressions. Usually, the ban of fishing starts from May 1st and lasts till 31st of July. During this period prohibition on catching of brood fish of certain species on any proclaimed fisheries is imposed[23]. During the post monsoon season, water level in different water bodies generally recedes and it allows fishing. The scale of fishing increases during this period. However, fishing becomes prominent during the winter season. It is during this period the community fishing is celebrated in the state. Under community fishing, local communities from different villages and localities assemble in a particular area and fish for an entire day[24]. The process of fishing may last for a week or near to a month in specified wetlands of Assam. However, the primary objective of community fishing is not to make profit by selling but to consume within the community and celebrate the tradition of fishing.

Figure 15 presents the season wise catch reported by respondents during the survey. As expected, the respondents informed winter (39%) to be the most favorable season for fishing in terms of catch followed by post-monsoon (24%), Pre-monsoon and summer (18% each) respectively.

Figure 15: Season wise catch of fish

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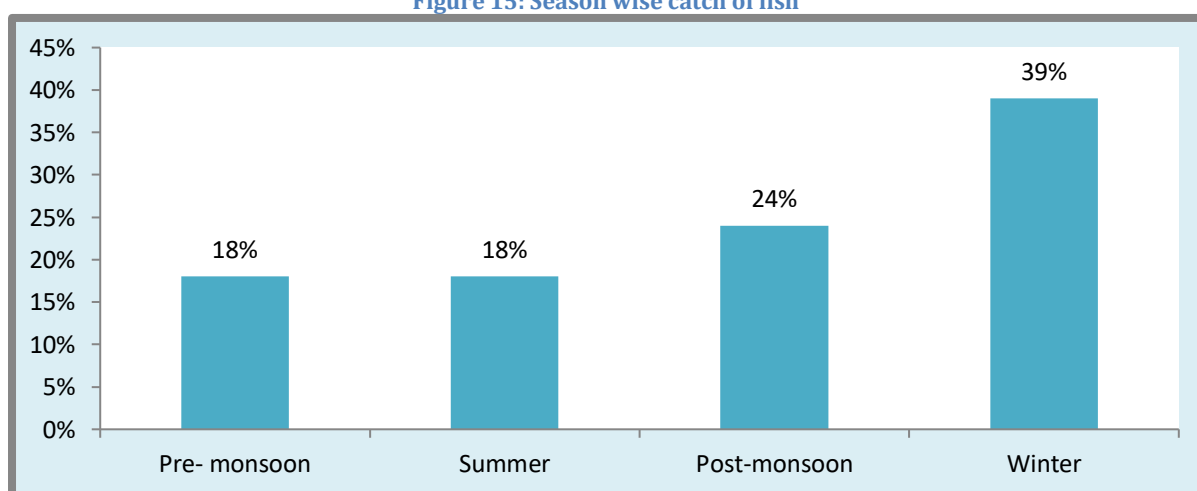
[23]Implementation of Assam Fishery Rules during ban period

[24]Traditional community fishing practices of rural Kamrup of Assam, Deepjyoti Baruah

3.3.2 Seasonal Quantity of Catch

Table 32 below shows season wise catch in terms of quantity of various categories of fish.

Table 32: Season wise catch of fish (Quantity)

	Pre- monsoon	Summer	Post-monsoon	Winter	Total
Indian Major Carps	80.868	86.476	107.445	178.088	452.877
Exotic Fish	17.726	16.491	28.857	32.255	95.329
Minor Carps	34.635	42.071	46.456	69.979	193.141
Live Fish	8.288	7.092	9.083	21.793	46.256
High Value Small Fish	9.213	7.461	10.916	24.657	52.247
Low Value Small Fish	7.915	7.125	11.320	16.052	42.412
Big Catfish	10.858	6.118	13.308	23.840	54.124
Minor Catfish	1.060	0.210	0.430	1.078	2.778
Others	0.150	0.100	0.200	0.225	0.675
Total	**170.713**	**173.144**	**228.015**	**367.967**	**939.839**

Notes: Figures are in Tonne
Source: Enterprise Survey

The aggregate production of fish from the nine sampled districts stands at 939.84 tonne. The maximum production happens during the winter season (367.97 tonne) followed by post-monsoon (228.02 tonne), summer (173.14 tonne) and pre-monsoon period. Among different categories of fish, major carp's categories have the maximum production of 452.88 tonne. Due to high growth, affordability and tastes, this category of fish is consumed by the majority of the population of the state. Next to major carps are the minor carp's categories of fish which has production of 191.14 tonne across 384 samples. Exotic category of fish comes in third place in terms of quantity at 95.33 tonne. Next to exotic fish are big catfish (54.12 tonne), High value small fish (52.25 tonne), Live Fish (46.26 tonne), Low value small fish (42.41 tonne), Minor catfish (2.78 tonne) and others category (0.68 tonne) respectively.

Figure 16: Catch of different species of fish
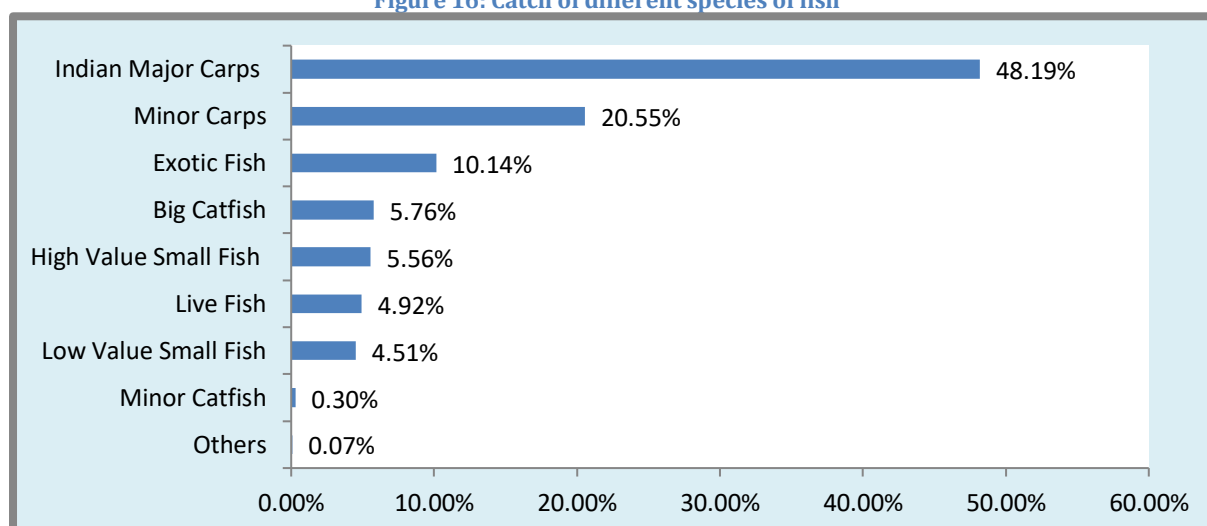
Figure 16 depicts the percentage of catch of different categories of fish. It is quite clear from the figure that major carps (48.19%) are the most widely available and captured fish in the state followed by minor carps (20.55%), Exotic fish (10.14%), big catfish (5.76%), high value small fish (5.56%), live fish (4.92%), low value small fish (4.51%), minor catfish (0.3%) and others (.07%) respectively.

3.3.3 Average wholesale and retail rate

In any businesses generally there are two types of marketing channels involved. Direct marketing channels and indirect marketing channels. Under direct marketing channels, the final product directly reaches to the consumer from the producer. There is no middleman involved in this case. On the other hand, in indirect marketing channels, the product reaches the final consumers through the middlemen. In the fishing trade in the state of Assam, the indirect marketing channel prevails, where the product (in this case is fish) is routed through middlemen before it reaches the final consumers. The chain typically involves players like producers, dealers, wholesalers, retailers, retailers who sell in other markets, fish hawkers and final consumers. As a result, the price of the product also enhances in each stage of the process. Hence the survey tries to estimate the price of the fish at the producers' end referring here as 'Wholesale price' for better understanding by the fishermen/ producer and the 'Retail price' which is paid by the final consumers.

3.3.3.1 Wholesale rate

Table 33 portrays the wholesale rate of different categories of fish in the state

Table 33: Wholesale rate of different species of fish

WHOLESALE RATE (in Rupees)					
Categories of fish	Pre-Monsoon	Summer	Post-Monsoon	Winter	Average
Indian Major Carps	174	172	173	186	**176**
Exotic Fish	115	126	123	133	**124**
Minor Carps	134	143	132	140	**137**
Live Fish	334	298	319	360	**328**
High Value Small Fish	236	229	233	224	**231**
Low Value Small Fish	99	116	124	128	**117**
Big Catfish	463	447	439	470	**455**
Minor Catfish	279	327	288	396	**322**
Others	367	450	450	367	**408**
Average	**245**	**256**	**253**	**267**	**255**

Source: Enterprise Survey

As per Table 33, the wholesale rate of Indian major carps which constitute almost 50% of the total production is at Rs. 176/- per Kg. Among the different categories of fish, the rate of big catfish is the maximum at Rs. 455/- per Kg, while the low value small fish has the least rate of Rs 117/- per kg.

3.3.3.2 Retail Rate/ Market Rate

The retail rate or the market rate is the rate final consumers pay to retail vendors to differentiate from intermediate prices paid upward in the supply chain. Table 34 provides the market rate of different categories of fish during various seasons.

Table 34: Retail rate of different species of fish

RETAIL RATE (in Rupees)					
Categories of fish	Pre-Monsoon	Summer	Post-Monsoon	Winter	Average
Indian Major Carps	256	250	255	269	**258**
Exotic Fish	173	191	190	196	**187**
Minor Carps	193	202	196	294	**221**
Live Fish	435	399	432	493	**440**
High Value Small Fish	337	318	325	322	**325**
Low Value Small Fish	159	182	194	198	**184**
Big Catfish	624	598	640	661	**631**
Minor Catfish	393	407	365	496	**415**
Others	483	550	550	467	**513**
Average	**339**	**344**	**350**	**377**	**353**

Source: Enterprise Survey

The above data reveals that big catfish has the maximum retail rate of Rs. 631/- per kg. Next to big catfish are the live fish which costs Rs. 440/- per kg followed by minor catfish (Rs. 415/-), high value small fish (Rs. 325/-), Indian major carps (Rs. 258/-), minor carps (Rs. 221/-), exotic fish (Rs. 187/-) and low value small fish (Rs. 184/-) per kg.

Figure 17 below shows the percentage difference between wholesale and retail rate of different categories of fish. The maximum variation is seen with regard to minor carps (61%) followed by low value small fish (57%), exotic fish (51%), major carps (47%), high value small fish (41%), big catfish (39%), live fish (34%), minor catfish (29%) and other categories (26%) respectively. On an aggregate level the overall difference between wholesale and retail rate of fish in the state is at 38%.

Figure 17: Percentage difference in wholesale & retail rate
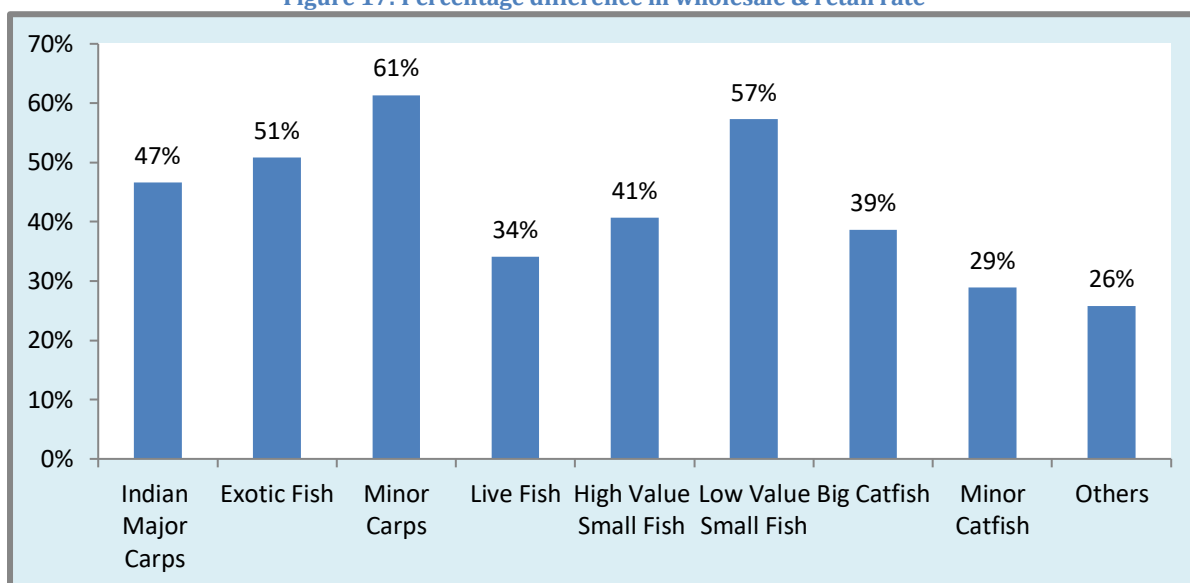
3.3.4 Total Output/ Production

The total output/ production from the enterprise survey have been calculated by multiplying total quantity of catch of each category of fish by their average wholesale rate. Table 35 provides the details of fish production and its average price.

Table 35: Total Production

Categories of fish	Total production (in kgs)	Average wholesale Rate (in Rs.)	Total output (in Rs.)
Indian Major Carps	452877	176	79706352
Exotic Fish	95329	124	11820796
Minor Carps	193141	137	26460317
Live Fish	46256	328	15171968
High Value Small Fish	52247	231	12069057
Low Value Small Fish	42412	117	4962204
Big Catfish	54124	455	24626420
Minor Catfish	2778	322	894516
Dry Fish	0	0	0
Others	675	408	275400
Total	**939839**		**175987030**

Source: Enterprise Survey

As per the Table 35, the total value of production is Rs 17, 59, 87,030/- (Rupees Seventeen crores fifty-nine lacs eighty-seven thousand thirty only).

3.4 Input Costs

As mentioned above, GVA from the fishing sector is estimated by production approach. It involves the estimation of total value of output at factor cost and deducting there from the value of various inputs at purchasers' prices which are used in the process of production. Hence it is important for the consultant to estimate the input cost. As on date, in absence of any data based on scientific studies, it has been assumed, after consultation with the State Fisheries Departments that the operational costs and repairs and maintenance in the case of marine fish, prawns, inland fish and subsistence fish, form 22.5 per cent, 22.5 per cent, 10 per cent, and 1 percent respectively of the corresponding items' values of output. For the activity of sun-drying and salting of fish, the inputs are assumed to be 1 percent of the value of output.

Operational costs broadly include expenditure on boats (mechanized and non-mechanized), trawlers, liners, fishing gears, gillnet, trawl-nets, cast-nets, traps, other bag-nets, consumption of diesel etc[25]. The expenditure for the purpose of arriving at the input cost, expenses towards the use of the equipment is taken into consideration and not the cost of purchase or value of the assets. The following are the major input costs involved in commercial fishing.

- Fish Seed: The fish seed being the major input for fish farming. There is always a growing demand for quality fish seeds. Fish seed of different varieties of fish is made available to the fish farmers by the Fisheries Department as well as by private sector eco-hatcheries firms.

- Fish Feed: Along with fish seed, fish feed is also an important component of input. After applying fish seed, fish feed in the form of oil cakes, rice bran etc. is essential for survival and growth of the fishes.

- Fertilizer: Fertilizers and manure in the form of lime, urea, cow dung, medicines and chemicals are also necessary for the survival and protecting the fish from various diseases.

- Marketing and transportation: Fish being a perishable commodity needs to be transported immediately after harvesting without delay. Therefore, marketing and transportation plays an important role in fishing business. Any delay on part of transportation can damage the fish crop as farmers lack storage and preserving facilities.

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[25] National Accounts Statistics, Sources & Methods 2012

- Repair & Maintenance: Repairs and maintenance of the fishing gears and crafts are the recurring expenses which every fish farmer has to bear. Some of the common expenses are repair and maintenance of hook, line, nets, boats and other related fishing appliances.

- Fuel & electricity: Another component of fishing business is fuel and electricity. Usually, fuel is a major cost when using mechanized boats for fishing. Marine fishing generally uses mechanized boats; non-mechanized boats are mostly used in inland fishing.   However, fish farmers have to incur expenses on fuel and electricity in running generators, pumps, offices etc.

- Wages and salary: Unlike subsistence fishing, commercial fishing involves engagement of manpower for doing various jobs such as applying seed, feed, fertilizers and medicines and for harvesting and marketing of fish. Generally, the larger the enterprise is, higher is the cost of labor.

Table 36 provides the aggregate cost of input reported by the commercial fisher enterprise in nine sampled districts of Assam

Table 36: Cost of various input used in fishing

Types of Input	Total Cost	Operational Cost
Fish Seed	27438050	N.A
Fish Feed	21802998	N.A
Fertilizer	10253460	N.A
Marketing & Transportation	2184400	2184400
Repair & Maintenance- Boats	1425400	1425400
Repair & Maintenance- Hook & Lines	898700	898700
Repair & Maintenance- Nets	2929700	2929700
Repair & Maintenance- Others	2603100	2603100
Fuel & Electricity	1666050	1666050
Wages & Salary	8356700	8356700
Others	3059800	3059800
Total	**82618358**	**23123850**

Source: Enterprise Survey

For the purpose of calculating input cost, the consultant has taken into consideration the operational costs which include marketing & transportation, repair and maintenance, fuel & electricity, labor cost but exclude the costs of fish seed, feed and fertilizers.

Figure 18 provides the share of each input in overall cost. It is seen fish seed covers the lion share of 33% of the total input cost. Next to fish seed is the fish feed which consumes 26% of the total cost. Fertilizers and manure take away 12% of the cost. Wages and salary constitute 10% of the total cost. The rest of the costs involve repair & maintenance of nets (4%), others (4%), repair & maintenance of other fishing gears (3%), marketing and transportation (3%), fuel & electricity

(2%), repair & maintenance of boats (2%) and repair & maintenance of hook & lines (1%) respectively.

Figure 18: Share of input costs

Category	Percentage
Fish Seed	33%
Fish Feed	26%
Fertilizer	12%
Wages & Salary	10%
Others	4%
Repair & Maintenance - Nets	4%
Repair & Maintenance - Others	3%
Marketing & Transportation	3%
Fuel & Electricity	2%
Repair & Maintenance- Boats	2%
Repair & Maintenance - Hook & Lines	1%
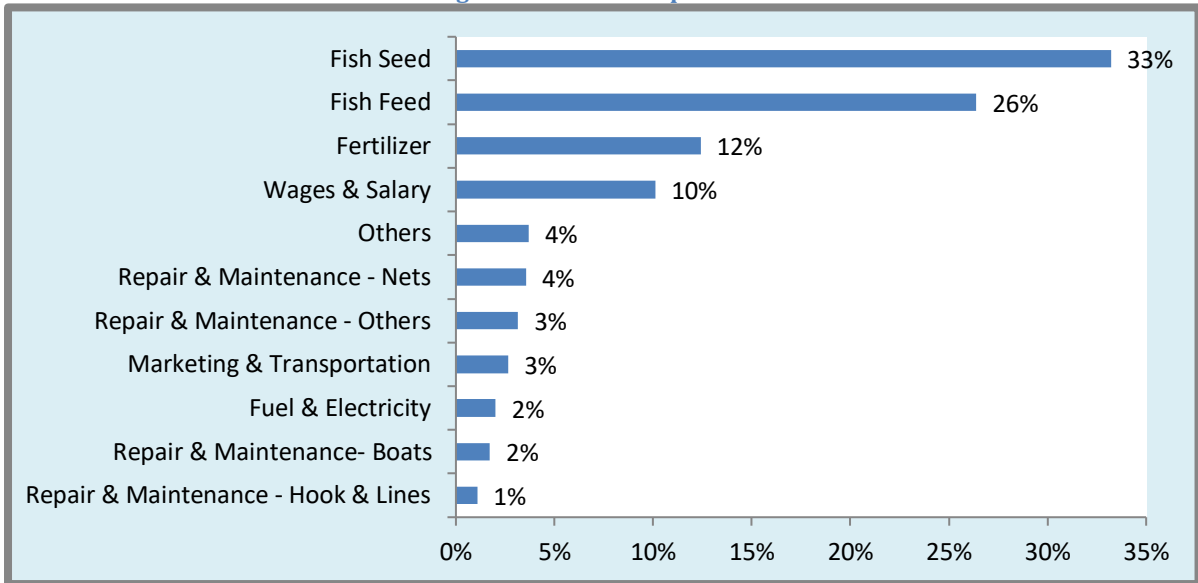
Image 12: Joint survey with DES officials and enterprise survey

3.5 Conclusion

This chapter has captured the information of fishing and aquaculture establishments. It covers the type of establishments run by the commercial fishermen, resources widely used for inland fishing, season wise production of different categories of fish, various inputs used in fishing and their cost. The major findings of the enterprise survey are presented below.

● It has been found from the enterprise survey that majority of fishermen runs their establishment as proprietary concerns (67%) followed by private sector establishment (23.2%), Self-help group (5.7%) partnership business (2.9%), cooperative societies (1%), and private limited company (0.3%).

● For commercial fishing 92% of the respondents informed about doing culture fisheries in ponds and tanks. Only 4.4% respondents do fishing in beels and 3.4% in rivers.

● Winter is the most favorable season for fishing. About 39% of the total annual production happens during this season followed by post-monsoon (24%), Pre-monsoon and summer (18% each) respectively.

● Major carps are the most sought-after fish of the state. About 48% of the total production represents major carps which includes Rohu, Bhokua/Catla, Mirka, grass carp, silver carp etc. Next to major carp categories are minor carp (20.55%), Exotic fish (10.14%), big catfish (5.76%), and high value small fish (5.56%), live fish (4.92%), low value small fish (4.51%), minor catfish (0.3%) and others (.07%) respectively.

● At the aggregate level, the wholesale price of fish in the state of Assam is Rs. 255/- per kg. The wholesale rate of Indian major carps which constitute almost 50% of the total production is at Rs. 176/- per Kg.

● The overall retail rate of fish in the state is Rs. 353/- per kg. The big catfish categories of fish has the maximum retail rate of Rs. 631/- per kg, followed by live fish (Rs. 440/- per kg), minor catfish (Rs. 415/-per kg), high value small fish (Rs. 325/-per kg), Indian major carps (Rs. 258/-per kg), minor carps (Rs. 221/-per kg), exotic fish (Rs. 187/-per kg) and low value small fish (Rs. 184/-per kg).

● On an average the spread between wholesale and retail rate across different categories of fish is around 38%.

● The total value of production of the sampled survey is Rs 17, 59, 87,030/- (Rupees Seventeen crores fifty-nine lacs eighty-seven thousand thirty only) across nine sampled districts.

- The three major components of input costs are fish seed (33%), fish feed (26%) and fertilizers or manure (12%). These three components constitute 71% of the total cost.

- The operational cost which includes labor cost (10%), marketing & transportation (3%), various repair and maintenance (10%), fuel & electricity (2%), others (4%) constitute 29% of the total fishing costs.

Image 13: Enterprise survey & household survey with DES officials

Chapter 4. Key Informant Interviews

The objective of this chapter is to extract first-hand information from key informants, that is, representatives from fishery departments, village headman, and academicians from fishery related fields to extract necessary information related to the study.

One of the crucial elements of the study is to calculate the percentage of households involved in fishing activity which can be commercial, artisanal or subsistence fishing. With the objective of estimating the percentage of fishing households, qualitative data collection method with key informants was given importance in this study. The key informants are the people who have the knowledge on the subject. Therefore, in rural areas, the respective village headman (Gaon bura) has been identified as the key man to collect the relevant information about the approximate number or percentage of households involved in some kind of fishing at least once a year. In absence of the village headman, the members of the village panchayats were approached to gather the required information. Similarly for urban areas, the same information has been extracted from the respective district fishery officials. Table 37 provides district wise number of key informant respondents.

Table 37: Frequency of Key informants

Districts	Method	Instrument	Rural	Urban
			Village Headman/ Panchayat Member	District Fishery Officials
Barpeta	Semi structured interviews	Guide for key-informant	3	1
Cachar			5	1
Dhubri			6	1
Dibrugarh			2	1
Jorhat			5	1
Kamrup Rural			5	1
Lakhimpur			5	1
Morigaon			3	1
Sonitpur			2	1
Total			**36**	**9**

Source: Key informant interview

In the entire nine districts, key informant guide was used to conduct the interviews.

4.1   Households engaged in fishing

In order to arrive at the estimation of households involved in fishing, interviews with village headman in rural areas and district fishery officials in urban areas were conducted. Table 38 provides the percentage of rural and urban households engaged in fishing.

Table 38: Rural and Urban Households engaged in Fishing

Districts	Rural Households	Urban Households
Barpeta	60%	20%
Cachar	55%	16%
Dhubri	54%	18%
Dibrugarh	40%	16%
Jorhat	31%	12%
Kamrup Rural	45%	15%
Lakhimpur	44%	17%
Morigaon	44%	20%
Sonitpur	42%	18%
Average	**46%**	**17%**

Source: Key informant interview

As per the above data, for rural areas, Barpeta reported maximum households engaged in fishing followed by Cachar (55%), Dhubri (54%), Kamrup Rural (45%), Lakhimpur & Morigaon (44%), Sonitpur (42%), Dibrugarh (40%) and Jorhat (31%) respectively. For the urban area Barpeta & Morigaon reported a maximum of 20% households doing fishing, while Jorhat reported least with 12% only.

Image 14: Meeting with Key informants (Fishery dept. officials & village headman)

Chapter 5.   Estimation- Rates & Ratios

5.1   Estimation of inland fish production- Raw form (excluding salting, sun drying and subsistence fishing)

The state of Assam is blessed with excellent subtropical climate for development of various freshwater fish in its diverse water bodies. As per the data available statistics, the state produces 373 million kg fish from all the sources during the year 2019-20 as against the nutritional demand of 393 million kg[26]. There has been progress in the production of inland fishery in the state, particularly the culture sector due to expansion of induced breeding technique units. The study aims to independently estimate the total fish production for the state through enterprise survey. Table 39 provides the total water spread area in terms of man-made fisheries and natural water bodies in the state. As per the below table the total water resources excluding forest fisheries and swamps is 329627.54 hectares

Table 39: Total water spread area in terms of man-made fisheries and natural water bodies

Water bodies	Types	Area (ha/km)
Man-made Fisheries	Ponds and Tanks (hectares)	75183.90
	Reservoir Fisheries (hectares)	996.00
	Total (hectares)	**76179.90**
Natural water bodies	Beels/Ox-box lakes (hectare)	100815.00
	Derelict water bodies (hectare)	94044.65
	Total (hectares)	**194859.65**
	Rivers (Kilometers)	4820.00

Source: Statistical Handbook Assam-2019

In order to arrive at the total fish production as a whole from the sampled data, multiplier has been applied. The multiplier is equal to the total quantity of fish production arrived from enterprise survey divided by sampled areas of different water bodies. The multiplier is then applied to the total water spread areas used for commercial fishing in the state to arrive at the total fish production.

Image 15: Household survey

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[26]Fish farming in Assam and producer company, Dr D.J. Sharma & Dr. S. Sarma, Assam Tribune Nov 21, 2020

Estimation of Total Fish Production						
Enterprise Survey (n= 384)						
Water bodies surveyed	Numbers (a)	Areas covered (b)	Production in tonne (c)	Multiplier (d)=c/b	Total water spread areas of the state (e)	Total estimated production in tonne (f)= d*e
Man-made Fisheries (Ponds & Tanks)	356	280.02 hectares	861.582	3.077	76179.9 hectares	234394.80
Natural Water Bodies (Beels, ox-bow lakes etc.)	17	147.05 hectares	57.087	0.388	194859.65 hectares	75647.42
Natural Water Bodies (Rivers)	13	81 kms	33.106	0.409	4820 kilometers	1970.01
Total						312012.23

Source: Field Survey

As per the above estimate done in Table 40 the total production for the state during the reference period 2018-19 for inland fish excluding salting, sun drying and subsistence fishing is 312012.23 tonne.

Image 16: Field survey

5.2 Estimation of subsistence production

In order to estimate the production of subsistence fishing, the first task is to estimate ratio of subsistence fishing to total inland production. Subsistence fisheries play vital roles in the lives of the households (mainly in rural areas) in the state of Assam. In order to obtain estimates of subsistence catch, the study has relied on household surveys to estimate the ratio of subsistence fishing to total production in terms of quantity since subsistence production is not recorded, or observed in the marketplace. Because adequate subsistence production surveys have not been performed in the past in the state, the values given rely on estimates of production based on demographics and consumption patterns of the households. As already mentioned above, the household survey segregated the fishermen household in terms of commercial, artisanal and subsistence based on their primary occupation and trading in the market. The percentage of subsistence production to Inland fish production (excluding. salting, sun drying & subsistence) has been obtained using the following process under Table 41

Table 41: Estimation of subsistence production

Nos.	Details	Commercial	Artisanal	Subsistence	Total
a	Average monthly consumption of fish (in kgs)[1]	9.7	9.3	8.4	
b=(a*12)	Average annual consumption of fish (in kgs)	116.4	111.6	100.8	
c	Average members in household[2]	5.42	5.7	5.18	
d=(b÷c)	Per capita annual consumption (in Kgs)	21.5	19.6	19.5	
e	Percentage consumption through own catch[3]	89.40%	74.10%	54.94%	
f=(d*e)	Subsistence consumption per annum (in Kgs)	19.2	14.5	10.7	
g	Fishermen population 2017 of Assam[4]	160154	612762	1751190	2524106
h=(g*f)	Subsistence production (in tonne)	3074.89	8889.95	18722.02	30686.86
i	Inland fish production excluding. salting, sun drying & subsistence[5] (in tonne)				312012.23
j=(h÷i)	**Percentage of subsistence production to inland production**				**9.84%**

Sources
1. Household survey – Figure 6: Household consumption
2. Household survey- Table 14: Fishermen members in the family
3. Household survey- Table 17: Sourcing through own catch
4. Handbook on Fisheries Statistics- 2018 (Table K-1)
5. Enterprise survey - Table 40: Estimation of total inland fish production-Raw form

5.3 Estimation of Fish Curing

Flood in Assam is a recurring phenomenon, every year after recession of flood and during community fishing practice (commonly known as jeng fishing in Assam), a variety of fishes are abundantly caught. Due to ample supply, the fish are often sold at a negligible price. The ethnic population of the state has developed unique traditional techniques for preservation of fishes (mainly small fishes) that are abundantly available in the natural resources of the region. A considerable quantity of fish is being preserved traditionally by way of drying, salting, fermentation and other local specific methods due to lack of sophisticated fish storage and preservation facilities in the state.

One such common technique of preserving the fish is sun drying and smoke drying. The traditional dried fish products prepared by ethnic people are known by different names and have unique taste and high nutritive value. It is worth mentioning that Asia's biggest dry fish market is situated in Jagiroad, a small industrial town in the Morigaon district of central Assam. Fish from all over the country arrive at Jagiroad dry fish market. Apart from Assam, different varieties of dry fish from Uttar Pradesh, Andhra Pradesh, Maharashtra, Gujarat and West Bengal are supplied to this market. The market operates only 3 days a week. The price of fish depends on the size and quality of the fish. The price of both sea fish and freshwater fish ranges from Rs 7 to Rs 110 per kilogram[27].

Another technique used by indigenous people of the state is fermentation of fish. The technique of fermentation is said to be evolved as an answer to inconvenience in drying of the highly perishable commodity due to high humidity and prolonged period of heavy rainfall during summer and low temperature and short sunshine hours during winter. However, there are variations in the fermentation process among different tribes. In addition to preservation, the fermentation process has some added benefits like enhancing flavor, improving nutritive and therapeutic value and digestibility[28]. The estimation for fish curing is done based on secondary studies. The estimation process is given in Table 42

Table 42: Dry fish output

Items	Units
Fish Dried- Unsalted Production (Assam)[29]	1080 Ton
Average Wholesale Price per kg[30]	Rs. 88.49 kg
Total Output	Rs, 9,55,69,200

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[27]http://www.assaminfo.com/tourist-places/55/jagiroad-dry-fish-market.htm

[28]Small Indigenous Freshwater Fish Species in Nutrition of Ethnic Population of North East India, Bibha Chetia Borah

[29]Handbook on Fisheries Statistics- 2018

[30]Journal of Entomology and Zoology Studies

As per the above estimate the total production in terms of value for dry fish in the state is Rs. 9,55,69,200/- (Rupees nine crores fifty-five lacs sixty-nine thousand two hundred only)

5.4   Estimation of total output in quantity from fishing sector

The total output from the fishing sector is estimated by taking into consideration the output of the various fishing activities. In the national accounts, the activities covered under inland fishing are

  i)   Commercial fishing in inland waters that include catching, tackling and gathering of fish from rivers, irrigation and other canals, lakes, tanks, fields etc. The produce of prawns is separately valued

  ii)   Subsistence fishing in inland waters and artificial ponds and

  iii)   Fish curing

Table 43 provides the total output of inland fishing from all the above-mentioned activities.

Table 43: Inland fish production in quantity

Output	Tonne
Inland Fish- (Raw Form)[1]	312,012.23
Prawns[2]	0.00
Subsistence Fish[3]	30686.86
Fish Curing (Fish Dried- Unsalted)[4]	1080.00
Total Output- Inland Fish	**343,779.09**

Sources
1. Enterprise survey - Table 40: Estimation of total inland fish production-Raw form
2. Handbook on Fisheries Statistics- 2018 (Table A-9)
3. Table41: Estimation of subsistence production
4. Secondary Data-Table 42 (Dry fish output)

As per Table 43 the overall output in terms of quantity for the state of Assam is 343779.09 tonne. Since Assam is a land lock state, the entire fish production comes from inland fisheries and aquaculture; hence there is no contribution of marine fishing and prawn fishing in the state. So far there has been no commercial freshwater prawn farming in the state since prawn seed is not being produced.

Image 17: Meeting with district fishery officials and field survey

5.5 Total fish production as per Government data and as per the study

Figure 19 provides the comparative data of fish production for the year 2018-19. As per the consultant estimate, the production for the state for the year 2018-19 is 343779.09 tonne while as per Directorate of fisheries, Govt. of Assam, the fish production for the 2018-19 was 331099.34 tonne. As per the study, fish production data for the state is 3.83% higher than the government estimate.

Figure 19: Comparative fish production (in tonne) for 2018-19
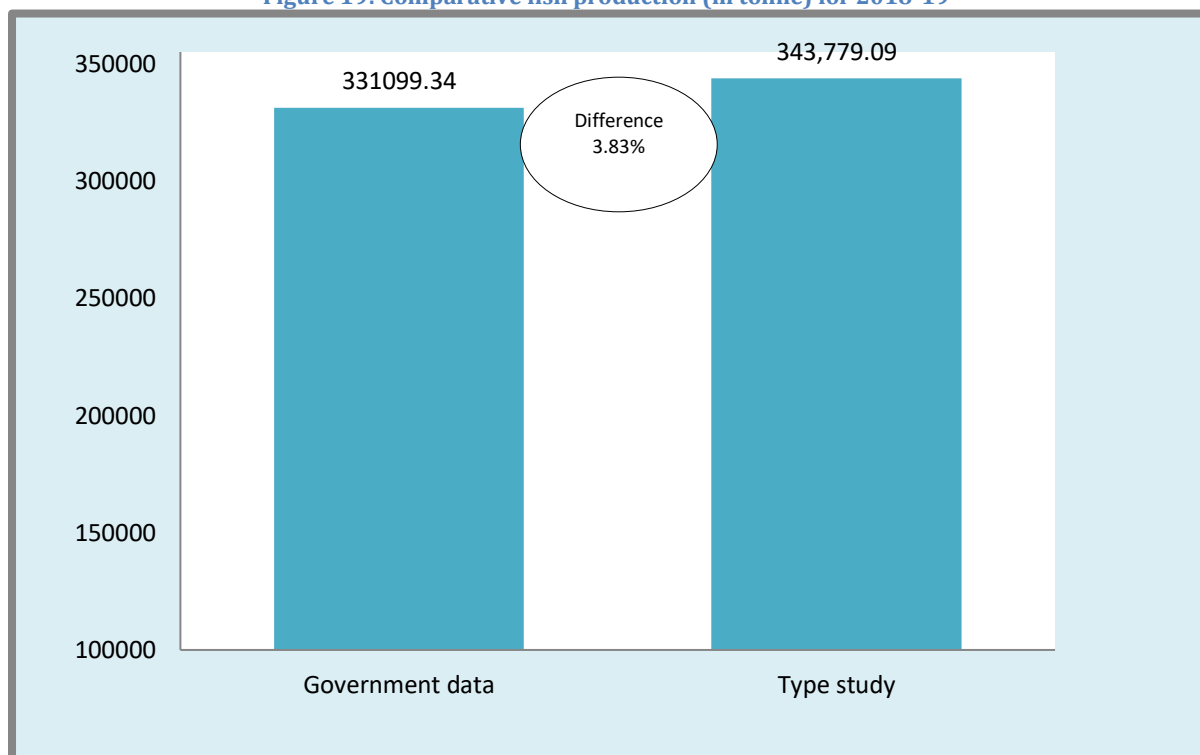
Source: Statistical Handbook Assam-2019 & field Survey

Image 18: Meeting with district fishery officials & field survey

5.6 Estimation of Input to Output Ratio of Commercial Fishing

As already mentioned in the previous chapter, Gross Domestic Product is the sum of Gross Value Added of all resident producer units of the economy, where GVA is the value of output minus the value of input used up in the process of production. Hence the study tries to figure out the GVA of commercial fishing in the state by estimating the value of output and value of input. Table 44 provides the details for estimate for the value of output and input for the state

<div align="center">Table 44: Input ratio calculation</div>

Nos.	Details	Units
a	Total Output[1] (in Rs.)	175987030
b	Total Input Cost[2] (in Rs.)	82618358
c	Total Intermediate Cost (Operational Cost)[2] (in Rs.)	23123850
d=(b÷a)*100	Percentage of Input to Output Ratio	46.95%
e=(c÷a)*100	Percentage of Intermediate Cost	**13.14%**

Sources

1   Enterprise Survey- Table 35 (Output in value)
2   Enterprise Survey- Table 36 (Cost of various inputs used in fishing)

As per the estimation of Table 44 above, the overall percentage of expenditure on inputs to value of output from fish farming in the state of Assam is 46.95%, while the percentage of intermediate cost is 13.14%. The input consumed in the production process is known as intermediate consumption or operational cost. The intermediate consumption includes marketing & transportation, repair and maintenance, fuel & electricity; labor cost but excludes the costs of fish seed, feed and fertilizers.

As per National Accounts Statistics, sources & methods 2012, the value of operational costs is taken as 10% of the value of output for the inland fish. As per the study, the intermediate cost or the operational cost is estimated at 13.14% of the value of output for the inland fish. Figure 20 below provides the comparison intermediate costs data of NAS and the survey.

<div align="center">Figure 20: Intermediate cost of inland fishing as per NAS & type study</div>
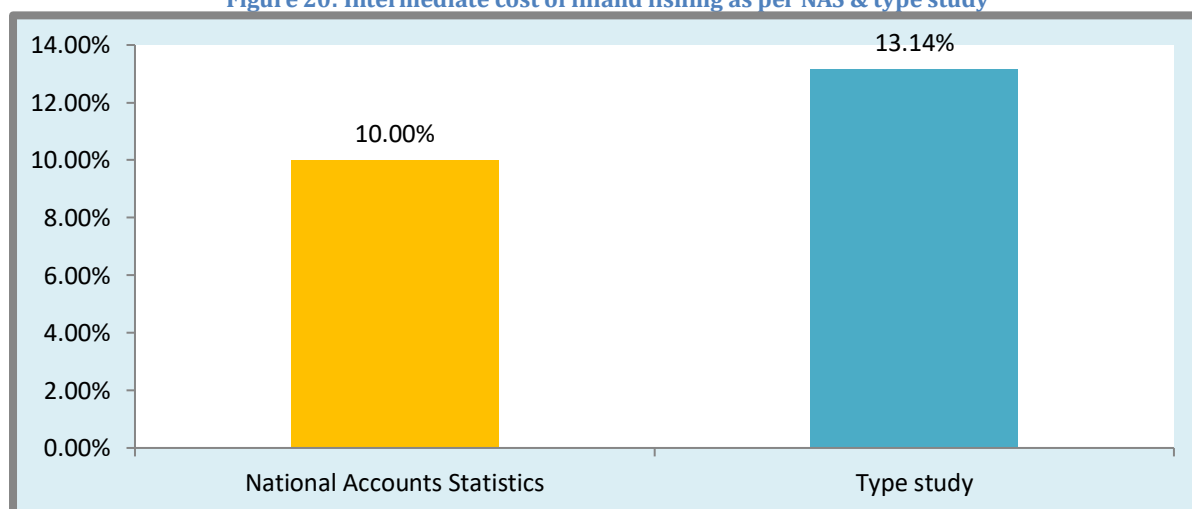
Source: National Accounts Statistics 2012 & field Survey

5.7   Estimation of Input Ratio of Subsistence Fishing

To arrive at the state's Gross Value Added (GVA) from subsistence, value of various input items are to be first deducted from the Gross Value of Output. For that it is essential to calculate the input percentage of subsistence fishing. Table 45 below shows the input percentage of subsistence fishing in the state.

<p align="center">Table 45: Input percentage of subsistence fisher</p>

Nos.	Details	Units
a	Average monthly catch by subsistence fishermen[1] (in Kgs)	6.74
b=a*12	Average annual production of subsistence fishermen (in Kgs)	80.88
c	Average wholesale rate[2] (in Rs.)	255
d=b*c	Annual production of subsistence fishermen (in Rs.)	20624.40
e	Subsistence fisher input cost per annum (in Rs.)[3]	528.00
f=(e÷d)*100	Subsistence fishing input ratio (in percentage)	**2.56%**

Sources

1   Household Survey- Table27: Details of fish catch per month by subsistence fisherman (in Kilograms)
2   Enterprise Survey- Table33: Wholesale rate of different species of fish
3   Household Survey- Table 23 (Input cost of subsistence fishermen)

For the purpose of estimating input ratio for subsistence fishing, the consultant has taken into consideration the mean wholesale rate of Rs. 255/- per kg arrived through enterprise survey. The rationale behind taking into consideration the wholesale price is that the fishermen would have received the wholesale price for what he sells. As per the above calculation, the study reveals that the operational costs and repairs and maintenance in the case of subsistence fish form 2.56 per cent of the corresponding items' values of output, as against the previously assumed value of 1 per cent.

Figure 21 below presents the comparative input ratio of subsistence fishing as per National Accounts Statistics, sources & methods 2012 & the type study

<p align="center">Figure 21: Intermediate cost of subsistence fishing as per NAS & type study</p>
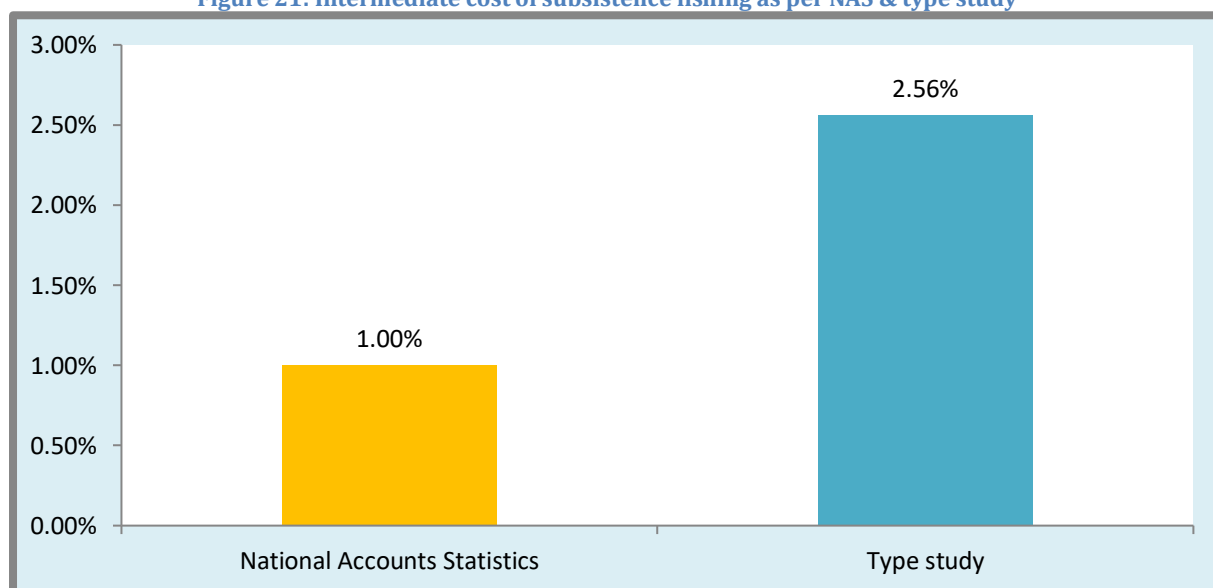
Source: National Accounts Statistics 2012 & field Survey

5.8   Estimation of total output in terms of value from fishing sector

In order to compute Gross Value Added (GVA) from the fishing sector, it is essential to estimate the total value of production from this sector. Table 46 provide the total value of production for the year 2018-19

Table 46: Inland fish production in terms of value

Output	Quantity	Rate	Value
	(Tonne)	*(Rs.)*	*(Crores)*
Inland Fish- (Raw Form)[1]	312,012.23	255.00	7956.31
Prawns[2]	0	N. A	0
Subsistence Fish[3]	30686.86	255.00	782.51
Fish Curing (Fish Dried- Unsalted)[4]	1080.00	88.49	9.56
Total Output- Inland Fish	**343,779.09**		**8748.38**

Sources
1. Enterprise survey - Table 40: Estimation of total inland fish production-Raw form & Table 33: Wholesale rate of different species of fish
2. Handbook on Fisheries Statistics- 2018 (Table A-9)
3. Table41: Estimation of subsistence production & Table 33: Wholesale rate of different species of fish
4. Secondary Data-Table 41 (Dry fish output)

As per table 46, the total production from fishing sector including inland fish in raw form, subsistence fishing and fish curing is estimated at Rs. 8748.38 crores. To arrive at this rate, the wholesale price calculated under enterprise survey has been taken into consideration for inland fish (raw form) and subsistence fishing. The value of fish curing has been obtained from secondary source as mentioned above. Since there has been no commercial freshwater prawn farming in the state, the prawn production has been kept as zero.

5.9   Estimation of total input from fishing sector

One of the important elements of GVA is to compute the value of various input used in fishing. Table 47 below provide the total input cost for the state for the year 2018-19

Table 47: Input cost of state fishing sector

Items	Percentage	Value (in crores)
Inland Fish- (Raw Form)[1]	13.14% of inland fish production	1045.46
Subsistence Fish[2]	2.56% of subsistence production	23.55
Fish Curing (Fish Dried- Unsalted)[3]	1% of fish curing value	0.10
Total		**1069.11**

Sources
1. Table 44: Input ratio calculation
2. Table 45: Input percentage of subsistence fisher
3. National Accounts Statistics- Sources & method 2012

As per table 47, the total value of input cost for the state of Assam for the year 2018-19 is Rs. 1069.11 crores.

5.10 Estimation of Gross State Domestic Product from Fishing Sector

In the state income accounts, the Gross Value Added (GVA) from the fishing sector is estimated by the production approach. Thus, it involves the estimation of total value of output and deducting from the value of various inputs at purchase prices which are used in the process of production. Based on the data arrived through household survey and enterprise survey, the GVA from the fishing sector has been estimated at the current price.

<div align="center">Table 48: GVA from fishing sector</div>

Items		Quantity	Rate	Value
		(Tonne)		*(Crores)*
Output	Inland Fish- (Raw Form)[1]	312,012.23	255.00	7956.31
	Subsistence Fish[2]	30686.86	255.00	782.51
	Fish Curing (Fish Dried- Unsalted)[3]	1080	88.49	9.56
	Total (A)	**343,779.09**		**8748.38**
Input	Inland Fish- (Raw Form)[4]			1045.46
	Subsistence Fish[5]			23.55
	Fish Curing (Fish Dried- Unsalted)[6]			0.10
	Total (B)			**1069.11**
GROSS VALUE ADDED (GVA)				**7,679.27**

Sources

1. Enterprise survey - Table 40: Estimation of total inland fish production-Raw form & Table 33: Wholesale rate of different species of fish
2. Table41: Estimation of subsistence production & Table 33: Wholesale rate of different species of fish
3. Secondary Data-Table 41 (Dry fish output)
4. Table 44: Input ratio calculation
5. Table 45: Input percentage of subsistence fisher
6. National Accounts Statistics- Sources & method 2012

As per Table 48, the Gross Value Added (GVA) from the fishing sector in the state of Assam for the period 2018-19 is 7679.27 crores.

<div align="center">Image 19: Subsistence fishing during flood</div>

5.11 Fishing & Aquaculture Contribution to GSDP

As per the estimate from the study, the contribution of fishing and aquaculture to the state GSDP at current price for the year 2018-19 is given under Table 49

Table 49: Contribution fishing & aquaculture to GSDP

Details	As per Govt. of Assam data	As per the study
	Amount (in crores)	
GVA from fishing sector at current price for 2018-19*	7646.71*	7,679.27**
Gross State Domestic Product (GSDP) at current price for 2018-19	323555.38*	323555.38*
Fisheries contribution to GSDP at Current Price for 2018-19 (in percentage)	2.36%	2.37%

Sources
* Statistical Handbook Assam-2019 (Table 2.01)
**GVA from fishing sector (Table 48)

As per the above table 49 the contribution of fishery to the Gross State Domestic Product of the state as per the Government estimate is 2.36%, while as per the data obtained through the study is 2.37%

5.12 Fishing & Aquaculture Contribution to the Primary Sector

The primary sector of the economy comprises broadly two segments i) Agriculture, Forestry and Fishing & ii) Mining and Quarrying. The first part is further segregated into a) Crops, b) Livestock, c) Forestry and Logging and d) Fishing & Aquaculture. The contribution of primary sector to the state economy is given under Table 50

Table 50: Contribution fishing & aquaculture to primary sector

No.	Primary Sector	Source	Amount (in crores)
1	Agriculture, Forestry and Fishing	Statistical Handbook 2019 (Table 2.01)	51106.91
1.1	Crops		36661.69
1.2	Livestock		3714.74
1.3	Forestry & Logging		3083.77
1.4	Fishing and Aquaculture		7646.71
2	Mining & Quarrying		35394.42
	Total		**86501.33**
3	GVA from fishing sector	Table 48	7,679.27
4	Contribution of fishing and aquaculture to the primary sector as per the type study		8.88%

As per Table 50, the contribution of fishing and aquaculture to the primary sector of the economy as per the type study is 8.88%

5.13 Method of Estimation of Economic Impact of Subsistence Fishing

To understand the economic impact of subsistence fishing in terms of output and employment in the state of Assam, it is important that the unsold output from subsistence fishing is valued at market prices as a proxy for opportunity costs. To estimate the opportunity cost from subsistence fishing, the following factors have been taken into consideration.

- *Step 1: Obtain the State's total number of Household Data.* The Census 2011 provides the state's total rural and urban household data.
- *Step 2: Extrapolating 2011 census data.* The household data has been extrapolated based on Geometric mean growth rate of household population and using the formula $P_n = P_o \left(1 + \frac{r}{100}\right)^n$. By using this method, a growth factor of 1.23 has been arrived at to account for an increase in population since 2011.
- *Step 3: Estimate the fish consuming households.* Based on the available data of households reported consumption of fish, the total number of households in the state who consume fish has been estimated.
- *Step 4: Estimate the households that engage in subsistence fishing.* Based on the Village headman (Gaon Burah) schedules survey for rural households and interviews with respective district fishery officials for Urban Households, the percentage of households engaged in subsistence fishing has been arrived at.
- *Step 5: Estimate mean number of times/months*. The mean number of times per month, subsistence fisher does fishing has been obtained from household survey (Figure No.7)
- *Step 6: Estimate mean hours/day.* The mean number of hours on any given day, subsistence fisher do fishing has been obtained from household survey (Figure No. 8)
- *Estimate Man Hours per annum:* The total man hours involved in subsistence fishing has been arrived at by multiplying total no. of households engage in subsistence fishing * Man hours engage per annum.
- *Estimate value of Subsistence fishing opportunity cost:* To arrive at the value of total opportunity cost of subsistence fishing for the state, the total man hours engaged has been multiplied by average per hour rate of unskilled labor.

Using these figures the total number of people fishing and their frequency of fishing effort has been calculated and detailed in Table 51

Nos.	Particulars	Rural	Urban	Total
a	Number of households as per 2011 Census[1]	5420877	985594	6406471
b	Percentage of households	84.62%	15.38%	100%
c	Number of households adjusted to account for population growth till 2019	6649473	1208971	7858444
d	Number of households reported consumption of fish in Assam per 1000 households [2]	804	750	777
e	Percent of households reported consume fish in Assam	80.40%	75.00%	77.77%
f= (c*e)	Total Number of households consume fish in the state	5346177	906728	6111512
g	Percentage of households that involved in fishing[3]	46.00%	17.00%	
h= (f*g)	Number of households engage in subsistence fishing	2459241	154144	2613385
i	Number of times in a month subsistence fisher households does fishing [4]			10
j	Average fishing hours per day- Subsistence fisher households [5]			1.5
k= [(i*j)*12]	Man hours per annum- Subsistence fisher households			180
l= (h*k)	Total household man hours involves in subsistence fishing			470409298
m	Minimum wages in Assam per day- Unskilled labour[6]			282.38
n	Minimum specified hours per day			8
o= (m/n)	Minimum wages in Assam per hour - Unskilled labour[5]			35.30
p= (l*o)	**Opportunity cost of labor-subsistence fishing (in crores)**			**1660.43**

Sources:

1   Statistical Handbook Assam 2019
2   Handbook on Fisheries Statistics 2018
3   Village Headman Survey & District fishery officials interview
4   Household Survey -Figure 7 (District wise frequency of fishing per month – in days)
5   Household Survey -Figure 8 (District wise average hours spent on fishing)
6   Minimum Wages Act 1948, (https://paycheck.in/salary/minimumwages/14054-assam/14241-fishing)

In economic term opportunity costs represent the potential benefits an individual misses out on when choosing one alternative over another. The consultant here tries to figure out the opportunity cost of labor in terms of value for subsistence fishing. As per the above calculation, the opportunity cost of labor for subsistence fishing in the state of Assam is approximately 1660.43 crores.

5.14 Conclusion & Findings

This chapter provides the overall findings from both the household and enterprise survey. By analyzing the data of both the surveys, the consultant has come up with the following findings.

- The total inland fish production (raw form) excluding salting, sun drying and subsistence fishing for the state during the reference period 2018-19 is 312012.23 tonne.

- The percentage of subsistence fishing to that of total inland production (raw form), excluding fish curing (sun drying and salting) for the state of Assam is 9.84%.

- Fish curing involves mostly sun drying, fermentation and salting of fish in the state. As per the available secondary data, the total production in terms of quantity for dry fish in the state of Assam is 1080 tonne and the average wholesale price per kg is Rs. 88.49/-. The overall output in terms of value for dry fish as per the above estimate is Rs. 9,55,69,200/- (Rupees Nine Crores Fifty Five Lacs Sixty Nine Thousand Two Hundred Only) in the state.

- As per the study estimate, the production for the state for the year 2018-19 is 343779.09 tonne while as per Directorate of fisheries, Govt. of Assam, the fish production for the 2018-19 was 331099.34 tonne. Hence the fish production data for the state as per the survey is 3.83% higher than the government estimate.

- The overall percentage of expenditure on inputs to value of output from fish farming in the state of Assam is 46.95%, while the percentage of intermediate cost is 13.14%. The intermediate cost is mainly the operational costs; it is the expenses towards the use of equipment for fishing and not the cost of purchase or value of the assets.

- The intermediate costs for the subsistence fishing arrived at 2.56%. The intermediate cost is essential in order to calculate the Gross Value Added (GVA) of subsistence fishing.

- As per the estimate, the total production from fishing sector including inland fish in raw form, subsistence fishing and fish curing is estimated at Rs. 8748.38 crores.

- One of the important elements of GVA is to compute the value of various input used in fishing. The total value of input cost for the state of Assam for the year 2018-19 is Rs. 1069.11 crores.

- The Gross Value Added (GVA) of the fishing sector in the state of Assam for the period 2018-19 is 7679.27 crores.

- The contribution of fishing and aquaculture to the state GSDP at current price for the year 2018-19 is 2.37% and to the primary sector is 8.88%

- The study calculates the unsold output from subsistence fishing as a proxy for opportunity costs. As per the estimate, the opportunity cost of labor for subsistence fishing in the state of Assam is Rs. 1660.43 crores.

Image 20: Field survey

ANNEXURES

QUESTIONNAIRE FOR ASSESSMENT OF SUBSISTENCE FISHING

Interviewer:	Date:
Name of the person: (In BLOCK Letters)	Mobile No.:
Caste:	Religion:
Location of interview:	
Village:	District:

PART 1: FISH CONSUMPTION

1. How many members are permanently living in the Household?

   ☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5   ☐ 6   ☐ 7   ☐ 8   ☐ 9   ☐ 10

   ☐ Above 10 members (Specify)_____

2. What is the main source of income of the household?

   ☐ Fishing   ☐ Agriculture/Animal Husbandry

   ☐ Own Business   ☐ Employment (Govt./ Private)

   ☐ Others (Specify)_____

3. Are all members of your family eating fish?

   ☐ Yes   ☐ No

4. If No, how many members in the family eat fish?_____ Nos.

5. How often does your family/household eat fish?

   ☐ Daily   ☐ 4-6 times per week   ☐ 1-3 times per week

   ☐ Once per week   ☐ Monthly (1-2 times)   ☐ Never

6. How much fish does your family eat (approx) in one month? _____Kg

7. How much of the household monthly fish requirement do you source from own catch?

   ☐ All (100%)   ☐ Maximum   (75%- 99.99%)

   ☐ More than half (50%- 74.99%)   ☐ Less than half (25%- 49.99%)

   ☐ Very little (0.1%- 24.99%)   ☐ None (0%)

8. How frequently you or your family members go fishing?

☐ Daily   ☐ 4-6 times per week   ☐ 1-3 times per week

☐ Once per week   ☐ Monthly (1-2 times) ☐ Never

☐ Others (Specify)_____

9. How much time you or your family members spend on fishing on any particular day?

☐ Less than 1 hour   ☐ 1-2 hours   ☐ 2-3 hours

☐ 3-4 hours   ☐ 4-5 hours   ☐ More than 5 hours

10. Do you sell the fish caught by the household in the market?

☐ Yes   ☐ No

11. If yes, how much of the total catch do you sell in the market?

☐ All (100%)   ☐ Maximum   (75%- 99.99%)

☐ More than half (50%- 74.99%)   ☐ Less than half (25%- 49.99%)

☐ Very little (0.1%- 24.99%)   ☐ None (0%)

12. How much is your family earned through fishing per month?

☐ Nil   ☐ Rs.1-4999   ☐ Rs. 5000-9999

☐ Rs.10000-14999   ☐ Rs. 15000-19999   ☐ Rs. 20000-24999

☐ Rs.25000-29999   ☐ Rs. 30000-34999   ☐ Above Rs. 35000

13. What type of fishing gear/ crafts the household generally used for fishing and what is the cost (approx) of such gears?

Fishing Gear/ craft	Cost of Gear
☐ Line Fishing (All types of Boroshee)	Rs. _____
☐ Cast Net/Gill Net (Asra Jaal/Langi Jaal etc.)	Rs. _____
☐ Wounding gear (Jathi/Dah/Dhonu etc.)	Rs. _____
☐ Traps (Sepa/Jeng/Thona/Khoka etc.)	Rs. _____
☐ Bag Nets (Chaloni/ Khorahi/Jakoi/Hat jaal etc.)	Rs. _____
☐ Boats (Tulunga nao/ Bahor bhur/ Kolor bhel etc.)	Rs. _____
☐ Others_____	Rs. _____

14. Where does the household go for fishing ?

☐ Beels   ☐ Pond   ☐ Swamps   ☐ River

☐ Others (Specify)_____

15. Which season is more favourable for fishing? Rank 1 to 4, where

1 =Most Favourable   2= Favourable

3= Less Favourable   4= Not favourable

Season	Months	Rank			
Pre-Monsoon	March- May	☐1	☐ 2	☐ 3	☐ 4
Summer	June- September	☐1	☐ 2	☐ 3	☐ 4
Post-Monsoon	October- November	☐1	☐ 2	☐ 3	☐ 4
Winter	December- February	☐1	☐ 2	☐ 3	☐ 4

16. What is the monthly average catch (in kgs) for different types of fish?

Categories	Types	Monthly Quantity (in Kgs)	Local price per Kg
MAJOR CARPS	Rohu/Bhokua/Mirka/Grass carp/ Common carp/ Silver carp etc. Others (Specify):_____		
MINOR CARPS	Lachim bhangon/ Kurhi/ China Puthi etc. Others (Specify):_____		
LIVE FISH	Magur/Koi/Singi/Goroi/Shal/Shol/Kuchia etc. Others (Specify):_____		
SMALL FISH	Moa/Puthi/Boriola etc. Others (Specify):_____		
BIG FISH	Aari/Chitol/Borali etc. Others (Specify):_____		

Additional Information (If any):

Supervisors Remark (If any):

(Signature of the Respondent)

QUESTIONNAIRE FOR ASSESSMENT OF SUBSISTENCE FISHING

সাক্ষাত গ্রহনকাৰী   :-   তাৰিখ   :-
সাক্ষাত দাতাৰ নাম :-   মোবাইল নং   :-
সম্প্রদায় (caste)   :-   ধর্ম   :-
সাক্ষাত গ্রহনৰ স্থান :-
গাওঁ   :-   জিলা   :-

অংশ ১- মৎস উপভোগ

□.আপোনাৰ ঘৰ খনত কিমান জন সদস্য আছে ?

১ ☐   ২ ☐   ৩ ☐   ৪ ☐   ৫ ☐   ৬ ☐

৭ ☐   ৮ ☐   ৯ ☐   ১০ ☐   ☐ ১০ জনৰ ওপৰত
(বর্ননা দিয়ক)

২. ঘৰখনৰ মুখ্য আয়ৰ উৎস কি ?
     ☐ মাছমৰা   ☐ কৃষি / পশুপালন   ☐ নিজা ব্যৱসায়

     ☐ চৰকাৰী / ব্যক্তিগত ভাবে নিযুক্তি   ☐ অনান্য ----------

৩. আপোনালোকৰ পৰিয়ালৰ সকলোৱে মাছ খায়নে ?

     ☐ হয়   ☐ নহয়

৪. যদি নহয়, পৰিয়ালৰ কিমান জনে মাছ খায় ? -------
৫. আপোনালোকৰ পৰিয়ালত কিমান সঘনাই মাছ খায় ?

     ☐ দৈনিক   ☐ সপ্তাহত ৪-৫ বাৰ   ☐ সপ্তাহত ১-৩ বাৰ

     ☐ সপ্তাহত ১ বাৰ   ☐ মাহত ১-২ বাৰ   ☐ একেবাৰে নাখায় ।

৬. আপোনালোকৰ পৰিয়ালত প্রতিমাহত আনুমানিক কিমান মাছ খোৱা হয় । --------------

৭. আপোনাৰ ঘৰখনৰ উৎস অনুসৰি মাহেকীয়া মৎস প্রয়োজন নিজা ক্ষেত্রৰ পৰা কিমান আৰু বজাৰৰ পৰা কিমান শতকৰা অংশ।

নিজে মাছ ধৰা ক্ষেৰৰ শতাংশ   বজাৰৰ পৰা ক্রয় কৰা শতাংশ

☐ ১০০% (সকলো বোৰ)   ☐ ০% একেবাৰে নাই
☐ ৭৫% - ৯৯.৯৯% (সর্বোচ্চ/সৰহকৈ)   ☐ ০.১% - ২৪.৯৯% সামান্য
☐ ৫০.% - ৭৪.৯৯% (আধাতৈকে সৰহ)   ☐ ২৫% - ৪৯.৯৯% কমকৈ
☐ ২৫% - ৪৯.৯৯% (কমকৈ)   ☐ ৫০% - ৭৪.৯৯% (আধাতৈকে সৰহ)
☐ ০.১% - ২৪.৯৯% (সামান্য)   ☐ ৭৫% - ৯৯.৯৯% (সর্বোচ্চ/সৰহকৈ)
☐ ০% - একেবাৰে নাই   ☐ ১০০% (সকলো বোৰ)

□) আপুনি বা আপোনাৰ পৰিয়ালৰ সদস্য কিমান সঘনাই মাছ মাৰিবলৈ যায় ?
     ☐ দৈনিক   ☐ সপ্তাহত ১-৩ বাৰ   ☐ সপ্তাহত ৪-৬ বাৰ

☐ সপ্তাহত এবাৰ   ☐ মাহেকত ১-২ বাৰ   ☐ কেতিয়াও নেযায়

☐) আপুনি বা আপোনাৰ পৰিয়ালৰ সদস্যই মাছমৰা বিশেষ দিনবোৰত কিমান সময় দিয়ে ?

☐ ১ ঘন্টাতকৈ কম   ☐ ১-২ ঘন্টা   ☐ ২-৩ ঘন্টা

☐ ৩-৪ ঘন্টা   ☐ ৪-৫ ঘন্টা   ☐ ৫ ঘন্টাতকৈ বেচি

১০) আপোনালোকে ধৰা মাছ বজাৰত বিক্রি কৰে নেকি ?
☐ হয়   ☐ নহয়

১১) মাহেকত ধৰা মাছৰ কিমান অংশ বিক্রি কৰে ?
☐ ০% একেবাৰে না   ☐ ০.১%-২৪.৯৯% সামান্য   ☐ ২৫%-৪৯.৯৯% কমকৈ

☐ ৫০%-৭৪.৯৯% আধাতকৈ সৰহ   ☐ ৭৫%-৯৯.৯৯% সৰহকৈ   ☐ ১০০% সকলো বোৰ

☐2) আপোনাৰ পৰিয়ালে মাছ মাৰি মাহেকত কিমান টকা আয় কৰে ?

☐ নাই   ☐ টকা ১ – ৪৯৯৯   ☐ টকা ৪৯৯৯ - ৯৯৯৯

☐ টকা ১০০০০ - ১৪৯৯৯   ☐ টকা ১৫০০০ - ১৯৯৯৯   ☐ টকা ২০০০০ - ২৪৯৯৯

☐ টকা ২৫০০০ - ২৯৯৯৯   ☐ টকা ৩০০০০ - ৩৪৯৯৯   ☐ ৩৫০০০ টকাৰ ওপৰত

১৩. মাছ ধৰাৰ কাৰনে কি কি সা সুজুলি ব্যবহাৰ কৰে আৰু সেইবোৰৰ আনুমানিক দাম কিমান ?

মাছ ধৰা সা-সুজুলি	দাম
☐ বৰশী	-----------
☐ ফাটিজাল (অচৰা জাল / লাংগি জাল)	-----------
☐ আহত কৰন সজুলি (জাঠি/দা/ধনু-কাড়)	-----------
☐ ফান্দ (চেপা/জাং/থোনা/খোকা)	-----------
☐ মোনা কৃতিৰ জাল/চেকনী(চালনী/হাতজাল/খৰাহি/জকাই)	-----------
☐ নাওঁ (তুলুঙা নাওঁ/বাহৰ ভূৰ/কলৰ ভেল)	-----------
☐ অন্যকিবা (বিৱৰণ দিব)	-----------

১৪.ঘৰখনৰ সদস্য বোৰে মাছ মাৰিবলৈ কলৈ যায় ?
☐ বিল   ☐ পুখুৰী   ☐ জলাশয়   ☐ নদী

☐ অন্যকিবা (বিৱৰণ দিব) -----------

☐☐. কোনটো ঋতু মাছধৰাৰ কাৰনে উপযোগি ? ১ পৰা ৪ যত ১ এ অতি বেচি উপযোগী আৰু ৪ যে সামান্য সুচাব।

ঋতু	মাহ	মূল্যায়ন (১ - ৪ লৈ)
প্রাক মৌচুমী	মার্চ - মে	-----------
গ্রীষ্ম	জুন - চেপ্টেম্বৰ	-----------
প্রত্যাবত্তী মৌচুমী	অক্টোবৰ - নৱেম্বৰ	-----------
শীতকাল	ডিচেম্বৰ - ফেব্রুৱাৰী	-----------

১৬. বিভিন্ন প্রজাতিৰ মাছৰ গড় মাহিলী পৰিমান কেজি হিচিপত কিমান ?

মাছৰ প্রজাতি	প্রকাৰ	মাহিলী পৰিমান কেজি হিচাপত	স্থানীয় নাম
মেজৰ কার্প	ৰৌ,ভকুৱা,মিৰ্গা,গ্রাছকার্প, কমনকার্প,চিলভাৰকার্প,অন্যান্য. ....(বিৱৰণ.....................		
মাইনৰ কার্প	লচিম ভাঙন,চাইনিচ পুঠি,কুৰৰচি,অন্যান্য. ....(বিৱৰণ................		
লাইভ ফিছ	মাগুৰ,কাৱৈ,শিংগি,গৰৈ,শাল,শ'ল,কুচিয়া,অন্যান্য, (বিৱৰণ...		
সৰু মাছ	মোৱা,পুঠি,বৰিয়ালা,অন্যান্য. (বিৱৰণ...		
ডাঙৰ মাছ	আৰি,চিতল,বৰালী,অন্যান্য, (বিৱৰণ...		
অনান্য			

অন্য আলচ্য বিষয়:-

পৰিদৰ্শকৰ মন্তব্য:-

সাক্ষাৎকাৰীৰ চহী

Annexure 3

QUESTIONNAIRE FOR FISHING & AQUA CULTURE ESTABLISHMENTS

Part I: Identification

Name of the enterprise		Name of the Interviewer	
Mobile No. of interviewer		Date of interview	
Village/Town & Code		District & Code	
Enumerator Name		Enumerator Mobile No	

Q1. Please mention the type of establishments.

☐ Govt./PSU Establishment ☐ Pvt. Sector Establishment ☐ Pvt. Co. Ltd. ☐ Non Profit Institutions

☐ Proprietary Establishment ☐ Partnership Establishment ☐ Co-operative Societies ☐ Self-Help Group

Q2. Which of the following inland resources are used for fishing?

Please Tick		Name (If any)	Area (in Hectares/ Bigha/ Km)
☐	Ponds & Tanks		
☐	Beels/ Lakes		
☐	Rivers		
☐	Others _____		

Q3. What is the source of the water?

☐ Natural ☐ Tubewell/Pumpset ☐ Canal/River ☐ Others_____

Part II: Output/ Fish Production

Q4. Please specify total turnover (sale) of fish production for 2018-19 _____

Q5. Please provide the season wise output/ fish production of various fish in last financial year 2018-19.

Categories of Fish	Pre-Monsoon (March- May)			Summer (June- Aug)			Post-Monsoon (Sept-Nov)			Winter (Dec-Feb)			TOTAL	
	Qnty.	WR*	MR*	Qnty.	WR*	MR*	Qnty.	WR*	MR*	Qnty.	WR*	MR*	Qnty	Value
Indian Major Carps *(Rohu/Bhokua/Mirka/Grass,Common carp etc.)*														
Exotic Fish *(Pangas/Rupchanda/ China puthi etc.)*														
Minor Carps *(Lachim bhangon/ Kurhi/ Bato etc.)*														
Live Fish *(Magur/Koi/Singi/Goroi//Kuchia etc.)*														
High Value Small Fish *(Moa/Koroti/Boriola/Kanduli)*														
Low Value Small Fish *(Chanda/Puthi/Botia etc.)*														
Big Catfish *(Aari/Chitol/Borali etc.)*														
Minor Catfish *(Singorah/Bahpotia/Pabho etc.)*														
Fresh Water Prawns														
Dry Fish														
Others														
TOTAL OUTPUT														

WR*: Wholesale Rate, MR*: Market Rate

Part III: Input used

Q6. How much cost you incur on fishing during 2018-19? Rs. _____

Q7. Please specify the total inputs used for fish production during 2018-19

Please Tick	Input used	Units in	Quantity	Rate (Rs.)	Value (Rs.)
☐	Fish Seed	In Lacs			
☐	Fish Feed	Kgs			
☐	Fertilizers/Manure	Kgs.			
☐	Marketing & Transportation	Rs			
☐	Repair, Maintenance & Rent of the Boats*(if applicable)	Rs.			
☐	Repair, Maintenance & Rent of the Hook & Lines* (if applicable)	Rs.			
☐	Repair, Maintenance & Rent of Nets* (if applicable)	Rs.			
☐	Repair & Maintenance- Others	Rs.			
☐	Fuel & Electricity	Rs.			
☐	Labour- Wages & Salary	Rs.			
☐	Others				

* Expenditure towards its use only is to be given and not cost of purchase or value of the assets.

Remarks (if any) _____

Signature of the respondent   Signature of the enumerator   Signature of the supervisor

মাছ মৰা আৰু মৎস উদ্যোগ নিয়োজনৰ বাবে প্ৰশ্নাৱলী ।

অংশ-১ পৰিচয়

প্ৰতিষ্ঠানৰ নাম		সাক্ষাত দিওঁতাৰ নাম	
সাক্ষাত দিওঁতাৰ মোবাইল নম্বৰ		সাক্ষাত গ্ৰহনৰ তাৰিখ	
গাওঁ/ টাউন & কোদ নং		জিলা& কোদ নং সাক্ষাত গ্ৰহনকাৰীৰ নাম	
সাক্ষাত গ্ৰহনকাৰীৰ নাম		সাক্ষাত গ্ৰহনকাৰীৰ মোবাইল নম্বৰ	

প্ৰশ্ন-১। অনুগ্ৰহ কৰি নিয়োজনৰ প্ৰকৃতি উল্লেখ কৰক সমবায়

☐ চৰকাৰী / ৰাজহুৱা খণ্ডৰ নিয়োজন   ☐ ব্যক্তিগত খণ্ডৰ নিয়োজন   ☐ ব্যক্তিগত কোম্পানি লিমিটেড

☐ অনাব্যৱসায়ী অনুষ্ঠান   ☐ ছত্ৰাধিকাৰী নিয়োজন   ☐ অংশীদাৰত্ব নিয়োজন

☐ সমবায়   ☐ আত্মসহায়ক গোট

প্ৰশ্ন- ২। তলৰ কোন বিধ আভ্যন্তৰীন সম্পদ মৎসক্ষেত্ৰ হিচাপে ব্যৱহাৰ কৰে ?

অনুগ্ৰহ চিহ্ন দিয়ক		যদি কিবা নাম আছে	মাটি কালি (হেক্টৰ / বিঘা / কি.মি.হিচাপত)
☐	পুখুৰী		
☐	বিল হ্ৰদ		
☐	নদী		
☐	অনান্য		

প্ৰশ্ন-৩। পানীৰ উৎস কি

☐ প্ৰাকৃতি   ☐ দমকল / পাম্পচেত   ☐ খাল- ডোং/নদী   ☐ অনান্য

অংশ- ২ সৰ্বমুঠ প্ৰাপ্তি /মৎস উৎপাদন

প্ৰশ্ন-৪ অনুগ্ৰহ কৰি ২০১৮-১৯ বৰ্ষৰ সৰ্বমুঠ বিক্ৰীৰ পৰিমান নিদিৰ্ষ্ট কৰক _____

প্ৰশ্ন-৫ অনুগ্ৰহ কৰি যোৱা ২০১৮-১৯ বৰ্ষৰ ঋতু অনুসৰি মুঠ প্ৰাপ্তি/ মৎস উৎপাদন দিয়ক -

মাছৰ প্ৰজাতি	পূৰ্ব মৌচুমী কাল (মাৰ্চ- মে)			গ্ৰীষ্ম কাল (জুন- আগষ্ট)			পৰবৰ্তী মৌচুমি কাল (ছেপ্তেম্বৰ - নবেম্বৰ)			শীত কাল (ডিচেম্বৰ-ফেব্ৰুৱাৰী)			মুঠ	
	পৰিমান	হ'ল চেল ৰেট	মাৰ্কেট ৰেট	পৰিমান	হ'ল চেল ৰেট	মাৰ্কেট ৰেট	পৰিমান	হ'ল চেল ৰেট	মাৰ্কেট ৰেট	পৰিমান	হ'ল চেল ৰেট	মাৰ্কেট ৰেট	পৰিমান	মূল্য
ভাৰতীয় মুখ্য কাৰ্প প্ৰজাতি: ৰৌ, ভকুৱা, মিৰ্কা, গ্ৰাছ কমন কাৰ্প ইত্যাদি ।														
বহিৰাগত প্ৰজাতি: কৃচ মাছ, ৰূপ চন্দা, চাইনা পুথি ইত্যাদি ।														
গৌণ কাৰ্প: লাচিম ভাঙন / কুঢ়ই /বাট														
জীৱন্ত মাছ: মাগুৰ/ কাৱৈ/ শিঙী/ গৰৈ / কোচীয়া ইত্যাদি।														
উচ্চ মূল্যৰ সৰু মাছ: মোৱা / কৰতি/ বৰিয়ালা/কানদুলী ইত্যাদি														
নিম্ন মূল্যৰ সৰু মাছ: চন্দা পুথি বতিয়া ইত্যাদি ।														
ডাঙৰ কেট ফিচ: আৰি/ চিতল/ বৰালি ইত্যাদি ।														
সৰু কেট ফিচ: শিঙৰা/ বাহপতিয়া /পাভ ইত্যাদি ।														
মিছা মাছ														
শুকান মাছ														
অনান্য														
সৰ্বমুঠ প্ৰাপ্তি														

অংশ- ৩ বিনিয়োগ

প্ৰশ্ন-৬ যোৱা ২০১৮-১৯ বৰ্ষৰ সময় ছোৱাত আপুনি কিমান খৰচ বহন কৰিব লগিয়া হৈছে ?_____

প্ৰশ্ন-৭ ২০১৮-১৯ বৰ্ষৰ সময় ছোৱাত আপুনি বিনিয়োগ কৰা ধনৰ শিতান নিশ্চিত কৰক –

চিহ্ন দিয়ক	ধনৰ বিনিয়োগ	এককত	পৰিমান	হাৰ / নিৰিখ (টকা)	মূল্য
☐	মাছৰ বিধান	...................লাখ			
☐	মাছৰ খাদ্য	...................কে .জি			
☐	ৰাসায়নিক/ জৈৱিক সাৰ	...............কে .জি			
☐	পৰিবহন আৰু বিক্ৰীৰ খৰচ	...................টকা			
☐	নাওঁৰ মেৰামতি, /ভাৰা যদি প্ৰযোজ্য হয়	...................টকা			
☐	বৰশী বা জাল মেৰামতি,/ ভাৰা যদি প্ৰযোজ্য হয়	...................টকা			
☐	অনান্য মেৰামতি,	...................টকা			
☐	ইন্ধন / বিজুলীৰ খৰচ	...................টকা			
☐	শ্ৰমিক হাজিৰা	...................টকা			
☐	অনান্য	...................টকা			

*এই ক্ষেত্রত কেৱল সা- সজুলি ব্যৱহাৰৰ বাবে হোৱা ব্যয় হে ধৰা হ'ব. সজুলি কিনা মূল্য ধৰা নহয় ।

মন্তব্য (যদি আছে) _____

সাক্ষাতকাৰীৰ স্বাক্ষৰ   সাক্ষাত গ্রহনকাৰীৰ স্বাক্ষৰ   চুপাৰভাইজৰ স্বাক্ষৰ

Annexure 5

QUESTIONNAIRE FOR VILLAGE HEADMAN/ GAONBURAH

Name of the Interviewer:	Date:

1. Name of the village...

2. Name of the Block/Revenue circle...

3. Name of the District...

4. Name of the Village Headman/ Gaonburah..
   ....

5. How many numbers of Households are there in the village?.....................

6. How many numbers of Ponds (Approx.) are there in the village?...............

7. Is there any river near the village?

   ☐Yes   ☐No

8. If yes, name of the river...

9. Is there any beel in or near the village?

   ☐Yes   ☐No

10. If yes, name of the beel...

11. Is there any water body in or near the village?

    ☐Yes   ☐No

12. If yes, name of the water body...

13. What percentage of households in the village does some kind of fishing?
    ☐100%☐90% ☐80% ☐70% ☐60% ☐50%
    ☐40% ☐30% ☐20% ☐10% ☐0%

Additional Information (If any):

Supervisors Remark (If any):

(Signature of the Gaon Burah)

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