# ECONOMICS OF EXTRACTION OF PRODUCTS FROM SUNDAR BANS RESERVE FOREST[1]

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## Abstract

The Sundarbans has a tremendous impact on the ecosystem of this country, region and the world as a whole. It provides livelihoods to the local and national economy. The Paper demonstrates that poverty levels of Sundarbans Impact Zone (SIZ) areas, compared to non-SIZ areas, are quite high. Naturally, the issue arises as to why the SIZ population is living in poverty and whether issues related to Sundarbans Reserve Forest (SRF) extraction activities have any bearing on this poverty situation. This Paper is an attempt to explore this through undertaking value chain analysis.  The study on which this Paper is based aimed to understand and, where possible, quantify the economics of extraction and sale of products marketed from the Sundarbans.

The Paper suggests that there are more than one million people directly involved with the resources extraction from the SRF. About 28% of the population in the impact zone are dependent on the SRF, and in future this dependence will increase, which is likely to aggravate the existing pressure. The increased population with few alternative livelihood opportunities poses a serious threat to the Sundarbans which is the main cause of mangrove destruction. The people and the community especially that of the bottom layer actors in the value chains, tend to fall in the process of pauperization.

The income distribution appears to be highly skewed in the SIZ area. While the bottom half (Deciles 1 to 5) of the actors have 15 percent of the total income, the top half (Deciles 6 to 10) of the actors accounts for as much as 85 percent of the total  income, with Gini coefficient for the SIZ area estimated as 0.52, as compared to 0.46 for Bangladesh, as a whole. Intuitively, given the existing economic situation, SRF extraction is deepening poverty levels, which may help widen the income gap between rich and poor in the SIZ area.

The Paper raises issues that are crucial in terms of return and equity, conservation and co-management, and suggests specific policy interventions in respect of, among others, improving the value chains and poverty situations of SRF actors (particularly of bottom layer actors), improving terms of trade and marketing system, conservation of the SRF and capacity of the FD, in order to help ensure improved and collaborative management of SRF and sustainable use of its resources.

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## I.  INTRODUCTION

The Sundarbans has a tremendous impact on the ecosystem of this country, region and the world as a whole. Apart from providing timber and fire wood resources, it is a source of food, crops, fish, medicinal plants, ecotourism and recreation. Aside from deriving economic value of directly extracted goods, the Sundarbans serves as coastal protection from cyclones and tidal surges. It provides livelihoods to the local and national economy. That sustainable use of the mangrove forest would yield higher welfare benefits than any other activities towards its development is well documented. A decision to develop Sundarbans Reserve Forest (SRF) would be "extremely damaging, not only to current population's welfare benefits but for the future generations as well"(see, for example, Landell-Mills 1995). This merely highlights the importance of protecting the SRF through its sustainable use.

The Paper demonstrates that poverty levels of Sundarbans Impact Zone (SIZ)[4] areas, compared to non-SIZ areas, are quite high. Naturally, the issue arises as to why the SIZ population is living in such poverty and whether issues related to SRF extraction activities have any bearing on this poverty situation. This Paper is an attempt to explore this through undertaking value chain analysis.

The major objective of the study of SRF Products Value Chain Analysis (on which this Paper is based) was to understand and, where possible, quantify the economics of extraction and sale of products marketed from the Sundarbans Reserved Forest (SRF). In other words, the study was expected to provide a foundation upon which economic and governance interventions can be more efficiently designed and implemented for the SRF and associated Protected Areas, in support of the improved, collaborative management and sustainable use of these resources.

The study uses the framework of the value chain analysis. The "VC approach" is also expected to enhance understanding of the constraints and the relationships among actors at each step of the chains, and associated product transformation. The study thus aimed to identify interventions that can improve the overall total value generated along the chains.

## II. METHODOLOGY

The study carried out using a structured questionnaire apart from adopting standard PRA tools and approaches e.g. Focus group discussions (FGDs), key-informant interviews, community survey, problem analysis and case studies. The principal stages are described below:

**The survey area**

The periphery of the SRF includes the areas assumed to be within a 20 km band surrounding the SRF[5]. This is what can be called the Sundarbans Impact Zone (SIZ)[6]. The SIZ vis-à-vis

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[4] SIZ is defined in this Paper as periphery within a 20 km band surrounding SRF.

[5] Sen, Soham G. (2010). *"Conservation of the Sundarbans in Bangladesh through Sustainable Shrimp Aquaculture,"* Nishorgo Project, Department of Forestry, Bangladesh.

[6] However, the only recently published *Strategic Management Plan for the Sundarbans Reserved Forest* (March 2010) defined SIZ as comprising 17 UZs.

the study area comprises 5 districts, 10 upazilas, 151 unions/wards and 1,302 villages, which are as follows (Table 1):

**Table 1: Sundarbans Impact Zone Areas**

| District | Upazila | Number of Unions/Wards | Number of villages |
|---|---|---|---|
| Bagerhat | Sadar, Mongla, Morrelganj, Sarankhola | 65 | 486 |
| Khulna | Dacope, Koyra, Paikgacha | 37 | 440 |
| Satkhira | Shymnagar | 13 | 216 |
| Pirojpur | Mathbaria | 20 | 94 |
| Barguna | Patharghata | 16 | 66 |
| ALL | | 151 | 1,302 |

**Sectors and products coverage**

The SRF products are broadly divided into five major categories: timber, non-timber, fish, aquatic, and non-aquatic resources. The timber category consists of sundori and other trees, followed by non-timbers consisting of goran, golpata, grass and hantal, fish consisting of gura fish, sada (large) fish, hilsha, shrimp, and shrimp fry, aquatic resources consisting of crab and mollusc, and non-aquatic resources consisting of honey. However, not all the items investigations have been carried out in details. Of these, for various reasons, the products such as sundori or goran (banned items), grass, hantal, *shutki* and mollusc (small sample size) have not been covered for detail level analysis in this report. However, the type of associated actors and flow chains of the above product list are contemplated.



Map of SRF Products Value Chain Study Area
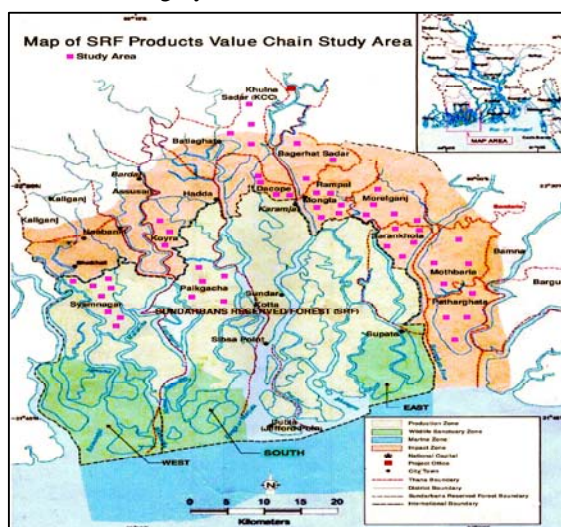
**Concentration areas and sampling**

The study identified 159 markets, 138 primary centers (landing places) and 21 secondary markets across 5 districts and 10 upazilas for the SRF products. These primary landing places for various SRF products were the sampling units. The sampling was adopted considering the following criteria: (1) 5 districts (2) 10 upazilas (3) 5 district towns (4) 45 Primary markets (Landing places) (5) 12 SRF products and (6) 7 Actors. Efforts were taken to make the sampling as representative as possible. The ultimate sample size was 237. A total of 47 FGDs was conducted across upazilas and activities. The sampling was constrained because of, among others, seasonality characteristic of the activities concerned.

**Mapping of actors and flows**

The following steps are involved in the present analyses:

- Mapping for core steps in a value chain
- Mapping for actors
- Mapping for number of actors and jobs
- Mapping for volume of products
- Mapping for geographical flows, and finally
- Mapping for the values at different levels of the value chain.

The theme of the present study was to map the monetary value throughout the chain. For simplicity, the study assumes no export activities in the process. In other words, only indigenous and local actors are under the purview of the present investigation. Figure 1 generally illustrates the ultimate output involving several steps.

**Figure 1: A typical SRF marketing system and value chain of the actors (% of retail price)**
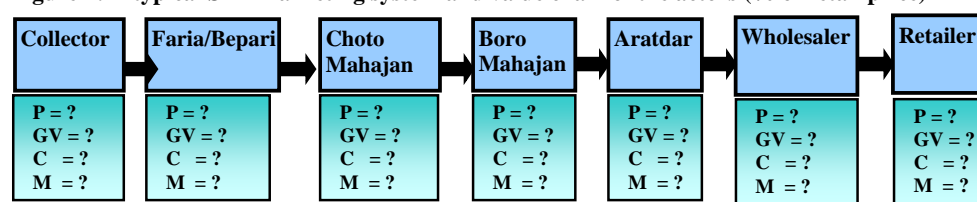


P = Price; GV = Gross Value; C = costs; M = Margin = VA – C

**Issues relating to estimation procedures**

As will be seen in subsequent sections, the marketing chains for the SRF products are complex and multi-dimensional, involving, again, innumerable combinations in a unique economic zone (Islam 2010). The complexity is compounded because of lack of standardization of SRF products in terms of size, quality and grade, for example, in accordance with respective origin (source) and destinations[7], Over and above, the study dealt with as many as 12 different sub-sectors, and at least 7 actors, spread over as many as 159 primary landing places of 5 districts and 10 upazilas.

Data generated through various methods are summarized and analyzed to seek estimates of the main research parameters. For example, to get an estimate of the average Gross Marketing Margin (GMM) for a particular agent of a specific product, average is made over all the collected/validated sample values. Similarly, agent and product specific Net Marketing Margin (NMM) is estimated. In a similar way, gross and net monthly returns are estimated from GMM and NMM by incorporating average volume of products traded. In normal situations, average selling prices of one actor should be equal to average buying prices of the next actors in the hierarchy in turn. Due to various reasons, this was not true. Consequently, the average selling prices were not used in estimating gross returns as buying prices were different than selling price of the preceding actors. In the case of the

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[7] For example, crabs have at least 16 grades; Sada fishes have more than 20 different species types, with various sizes and quality.

original resource collectors, cost of collection includes associated living expenses, or any official and unofficial payments.

This Paper entails value chain analysis in its simplest meaning in that the activities centered around SRF products are assessed for values in terms of prices and overall returns starting from resource collectors to ultimate retailers. Focus is given on social relationships among actors involved across supply value chain.

The emphasis is given on estimating gross and net returns of individual actors on a monthly basis so that their relative positions, in terms of income and inequality, for example, are revealed. The value additions for the resource collectors, who largely worked for others on wages with associated costs borne by trip organizers, are considered to be merely the price at which the products are sold.

The study also estimated the extent of income concentration both in area and intermediaries level (share of income of top few traders in total income) in order to have an idea about possible market power and income inequality prevailing among SRF actors.

### 1.3 Brief profile of SIZ Districts and Upazilas
### Population and basic facilities

The five SIZ districts have an estimated (2011) population of 80.9 lacs which constitute about 5.7 percent of the total Bangladesh population. SIZ districts have an area of about 15,352 sq km which represents 10.4 percent of country's area. The density of population in SIZ districts (529) is far below the national average (1015), nearly 52 percent less.

Approximately 49 percent of the total area of five districts lies in SIZ. Khulna has the highest area to lie in SIZ (72.3%), followed by Satkhira (51.0%), Bagerhat (41.4%), Pirojpur (27.0%) and lowest in Barguna (21.1%). About 52.5 percent of the households in the SIZ enjoyed the electricity connection which was lower than the country as a whole (54.6%). Similarly, the number of active tube wells per $Km^2$ in SIZ is 113 compared to 168 & 201 in coastal and national average. The percentage of households enjoying sanitation in SIZ is 62.3, which compares favorably with the national average (63.5%). Child mortality rate for every thousand is estimated at 64, compared to 60 for the coastal district and 64 for Bangladesh as a whole.

### GDP and livelihoods

Based on available information from BBS, most of the SIZ districts have miserably low level of GDP per unit area, indicating low regional development. An average SIZ district has GDP per sq km of only TK 33.3 million, compared to TK 42.6 million in that in coastal zone and TK 53.4 million in an average district in Bangladesh.

### Poverty situation in SIZ

Head Count Ratios (HCR) for the SIZ districts and upazilas show an extremely dismal picture. The SIZ upazilas have a much higher extreme poverty rates (0.42) compared to non-SIZ upazilas in Bangladesh (0.26)[8].

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[8] Based on Cost of Basic Needs (CBN) method, incorporating the BBS-2005 poverty data.

The HCR for SIZ Bagerhat is estimated as 0.43 as compared with 0.24 for non-SIZ upazilas of Bagerhat, followed by SIZ Khulna (0.41) and non-SIZ Khulna (0.32), and SIZ Satkhira (0.65) and non-SIZ Satkhira (0.45). The only exception is for Barguna (SIZ – 0.36 and non-SIZ -0.43). For Pirojpur, the HCR is almost identical (SIZ – 0.18 and non-SIZ – 0.19). Hence, among the upazilas, the estimated HCRs are relatively higher for Shymnagar (0.65), Dacope (0.60) Morrelganj (0.50), Sarankhola (0.49) and Mongla (0.42). Relatively less worse situation prevails for Mathbaria (0.18), Bagerhat Sadar (0.32), Paikgacha (0.34), Koyra (0.35) and Patharghata (0.36).

## III. RESULTS AND DISCUSSIONS

### 3.1 Findings on Features Related to SRF Extractions
### Major SRF Actors and their Functions/Roles

#### Collectors

They collect or produce SRF products and thus constitute the primary link to the marketing chain. Collectors, largely work for wages, usually cannot sell their products directly to the market.

#### Farias

Generally found largely in the case of honey and fish, Farias are petty traders operating with small capital and small volume of business compared to other intermediaries.

#### Beparis

Beparis are relatively more professional traders who bought a large quantity of the production from collectors or Farias, and sold directly or through Aratdars to wholesalers. They operated in both primary and secondary market.

#### Majhi (Boatman)

In a few cases (e.g. fishers or golpata collectors), the group of collectors is led by one boatman, known as Majhi, who is contracted for the harvest by Mahajans or Aratdars or Bahaddars.

#### Choto Mahajan

Choto Mahajans organized, operated and financed resource collections with workers, wages, nets, gears, ropes and boats; and in return they bought products at fixed but usually reduced prices. At the end, they sell products to Boro Mahajan or Aratdars.

#### Boro Mahajan

Boro Mahajans are also sometimes money lenders, implicitly or explicitly. They undertook commercial collection of SRF resources with higher investment (relative to Choto Mahajan) from their own. They make business out of managing/investing in resource collection in SRF areas, and control trips in overall resource collection. They are responsible for arranging permits for the workers in their name from the Forest Department (FD).

#### Bahaddar

They are the main entrepreneurs who invested and managed the whole process of fishing.

#### Aratdars

The Aratdars were generally self-financed in operating the business as they usually serve as the commission agents. Aratdars were few in numbers but powerful and apparently highly beneficial group in the value chain. They maintain liaison with various departments,

bureaucrats and politicians, and influence to protect their interests often at the costs of SRF. Some Aratdars are also money lenders, implicitly or explicitly, and some take part in auctions of SRF products.

**Paikars**

Paikars usually operated in fish markets. Small Paikars operated in local markets while the large ones participate in fish auction process at Arats in landing places. They paid commission to the Aratdars.

## Collection and Payment System

### Golpata

The Golpata collectors are generally involved in collection of golpata (Nypa fruticans) and also other non-timber products such as goran, hantal (often called Bawails); they often become involved in illegal felling of trees under the leadership of big Aratdars or urban elites. As in other collections, at times, golpata collectors become prey to tigers or dacoits.

### Gura (Small)/Sada (white) Large Fish[9]

Normally fishing takes place on a weekly basis. There are two *goons (peak) – bhara goons* and *mara goons* in a month, each lasting 4 to 5 days[10]. Like in other harvests, some of the intermediaries in this sector as well are themselves involved with the collection related activities. Mahajans or Aratdars have to invest in nets and boats for fishing, having many risks in case of accident, cyclone, bad harvest or robbery or thefts. The general practice is that all sorts of costs (including costs of fuel of those which are run by engines, food and net repairing) borne by owners during the trip are deducted from total earnings. In some cases, the sharing of profit applies. In some cases, collectors work on wages.

### Hilsha fish

Most fishermen get engaged in hilsha fishing on the basis of sharing of harvest among fishers (fishing laborers) and the capital providers (net/boat owners). Normally, the group leaders (Majhi) received twice the amount of each fisher.  The general practice is that the fishers cannot sell their catch in markets other than the specified markets/Aratdars/wholesalers at a lower than the market price because of contractual obligations. Generally, the fishers (laborers) received advance money (dadons) in the lean season from net/boat owners on condition that they would work for the whole season for the owners. In the fishing grounds, they worked under a boatman/captain (Majhi) who is responsible for the whole trip.  The general practice is that all sorts of costs for the trip are borne by owners which was deducted from total earnings and a share of 10/16 (i.e. 62.5%) is retained by capital providers.

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[9] Gura represents small and Sada represents large white fish, as they are called locally. Gura fish includes, among others, Amadi, Fesha, Chanda, Tela, Kowa, or any other small species. Sada (white) fish consists of, among others, Rupchanda, Bhola, Pasha, Bhetki, Pangas and Payra.
[10] Bhara goons are the situation referring to most appropriate time - when fish catch is most plentiful around full moon (*Purnima*).  Mara goons are when fish catch is, again, plentiful around new moon (*Amabasha*).

**Crab**

Aratdars in this sector are themselves involved with the collection related activities. Farias are also involved in the collection process. On an average, one boat with more or less 2 collectors catches in the range of 20-40 Kg of crab. Usually, Farias carried out the stocking in depots from collection grounds. Some Farias who are directly involved in the collection process sometimes sell their products to Aratdars.

**Honey**

The Forest Department issues permits every year to groups of six to eight members for one month. Majhis or boatmen, responsible for the whole management, carry honey every week to Mahajans through collection from harvesters. Mahajans act as financiers and lend money (in the form of dadons) to collectors, either on interest or sharing a profit or selling at reduced prices.

**Other Features Related to SRF Products Collection**
Collectors Working for Other Actors

The collectors are the most vulnerable. This is demonstrated from the fact that about 95 percent of the collectors work for wages or work/collect for others (Islam 2010). Most collectors work for Boro Mahajans (43.4%), followed by Choto Mahajans (38.3%), Aratdars (11.6%) and Farias/Beparis (4.7%).

Distance of Harvest Place from Home Village

The average distance of harvest place from home village of the respondents is 34.4 km. In terms of products, hilsha fishers have to travel the longest distance (67.7 km), followed by golpata collectors (50.3 km), honey (34.8 km), crab (31.2 km) and gura fish collectors (29.5 km).

Distance between  Collection Point and Markets

Distance from collection points to markets can be regarded as a proxy of existing marketing facilities. Average distance between collection point  and primary (landing) markets is around 41 km and the average distance between  primary markets and secondary markets (wholesale) is even further, around 61 km.

Days Spent in Collection of SRF Resources

Highest time is required in collecting golpata (32 days), followed by for honey (25 days-in several trips together), hantal (19 days), hilsha (12 days), crab (8 days), gura fish (6 days) and sada (white) large fish (5.5 days).

Working Months and Days for SRF Products/Activities

A profile of working months and days for SRF activities shows that peak months range from 3 to 6 months, except for grass and hantal which is in the range of 9 months. Average peak months considering all the SRF products together amount to around 5 months. Non-peak months (adjusted for number of days worked) range from 2 to 6 months, but most products

have non-peak months of 2 to 3 months - the overall average being around 3.7 months. On an average, SRF actors work 23 days in the peak season and 14 days in non-peak months.

Capital Structure of Activities

Fixed capital includes value of land and buildings while working capital includes (which is traditionally called Chalan) expenses such as repair of boats, nets, salary, wage, fuel, transpiration and unofficial expenses, etc to run day-to-day business. Capital structure of SRF activities is basically working capital oriented (Islam 2010).

**Dadons and Sundarbans Economy**

It is revealed that the Sundarbans economy, centering around informal credit arrangement (dadon), is a sort of unique system heavily accessible based on Relationships (social connection), Linkages (business connections) and Trust level (social capital formed among actors community). The study suggests that the network has created moderate to strong scale of both vertical (between actors along value chains) and horizontal linkages (between actors at the same level of value chains)[11].

More than 95 percent of the working capital by SRF collectors are derived from dadons, whereas only 5 percent are derived from the NGOs and other sources (Table 2). For all the actors together in the value chains, dadons account for 37 percent, the banks and the NGOs accounting for 4.8 percent and 12.4 percent of total finance respectively (Islam 2010). The remaining capital is derived from either own or personal sources[12]. There are obvious reasons for which SRF actors such as the collectors prefer dadons to all other sources. One major reason is that dadons provided physical security (e.g. from pirates), social security (in lean and hazard periods) and financial securities (fund for running extraction activities) to the collectors, a feature institutional sources seldom can provide. Indeed, the SRF economy is characterized by a unique market and financial system.

Almost all the actors starting from collectors either receive or offer dadons this way or that way. The higher levels of actors mostly offer dadons against sales obligation to their clients. The Aratdars, for example, consist of Choto Aratdars who receive and Boro Aratdars who offer dadons. They also comprise local and non-local Aratdars. Boro Aratdars also receive advance. With a few exceptions with wholesalers, the retailers and wholesalers do not receive any dadons but they carry out business with Aratdars on credits at some enhanced prices of their products. Similar is the case with retailers.

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[11] Such features are likely to have enabled the value chain actors to arrive at a more efficient linkage, through reduction of transaction costs, but this needs to be verified through further investigations.
[12] Personal sources are also not always free of costs, at times, offered at some 'invisible' profit and interest.

**Table 2: Capital structure and dadons associated with SRF actors**

| Actor type | Capital structure (TK) | | | Dadon Received (TK) | Dadon amount as % of working capital |
|---|---|---|---|---|---|
| | Fixed capital | Working capital | Total capital | | |
| Collector | - | 4,365 | 4,365 | 4,178 | 95.72 |
| Faria/Bepari | 16,977 | 40,955 | 57,932 | 23,727 | 57.93 |
| Choto Mahajan | 86,766 | 87,043 | 173,809 | 53,170 | 61.08 |
| Boro Mahajan | 217,250 | 511,500 | 728,750 | 180,250 | 35.24 |
| Aratdar | 151,879 | 466,424 | 618,303 | 119,394 | 25.60 |
| Wholesaler | 37,500 | 396,250 | 433,750 | 140,833 | 35.54 |
| Retailer | 15,278 | 201,389 | 216,667 | 106,389 | 52.83 |
| All | 64,,032 | 169,470 | 233,503 | 63,129 | 37.25 |

It was difficult to identify what are dadons and what are credits as there are many ways of repayment - repayment in cash with interest (47.6%) or without interest (4.0%), repayment in goods at market price (16.7%) and repayment at reduced market price (33.3%) (Islam 2010). It is revealed that the collectors have to sell their collected products at a price reduced by up to 22.5 percent compared to prevailing market price, depending on products. Purchasers also took additional share for the dadons by making pilferage in terms of weights of quantity of the purchased products, especially aquatic products. These credits or advances were coming as dadons against which there is an obligation of selling/purchasing those goods at some market or reduced price.

As the dadon-takers, more often the harvesters usually cannot pay off the debt, the whole cycle is never ending and they remain locked for a long time, sometimes for ever. Some of the dadondars (dadon givers) charge interest (usually 2-10% on a trip basis) on sales. They also take additional share of profit for their investment, apart from making pilferage in terms of weights on the purchased quantity. It is revealed that in a few places the commission is as high as up to 20 percent, in aggregate, on sales.  In spite of the above, dadons are greatly preferred to bank or NGO loans as they are easily available in adequate amounts.

**3.2 Mapping for Core Steps and Actors in Value Chains**
**Mapping for Core Steps in the Value Chain**

The marketing chains for the SRF products are complex, multi-dimensional with innumerable combinations. Among innumerable combinations, the following marketing chains are most dominant and commonly found.[13]:

**Timber**
**Sundri**

Chain 1: Collector $\Rightarrow$ Mahajan $\Rightarrow$ Aratdar $\Rightarrow$ Wholesaler $\Rightarrow$ Retailer
Chain 2: Collector $\Rightarrow$ Choto Mahajan $\Rightarrow$ Boro Mahajan $\Rightarrow$ Aratdar $\Rightarrow$ Wholesaler $\Rightarrow$ Retailer

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[13] For details, see Islam (2010).

**Non-timber**
**Golpata**

Chain 1: Collector $\Rightarrow$ Mahajan $\Rightarrow$ Aratdar $\Rightarrow$ Wholesaler $\Rightarrow$ Retailer
Chain 2: Collector $\Rightarrow$ Choto Mahajan $\Rightarrow$ Boro Mahajan $\Rightarrow$ Aratdar $\Rightarrow$ Wholesaler $\Rightarrow$ Retailer
Chain 3: Collector $\Rightarrow$ Choto Mahajan $\Rightarrow$ Boro Mahajan $\Rightarrow$ Choto Aratdar $\Rightarrow$ Boro Aratdar
                $\Rightarrow$ Wholesaler $\Rightarrow$ Retailer

In a few cases, again, Beparis or Farias also exist along the chain between collectors and Mahajans. It must be noted that sometimes the chains are not systematic as shown above. Although more often collectors sell their products to Choto Mahajans or Boro Mahajans some also sell their products directly to Aratdars or wholesalers depending on from whom they have taken dadons. In other words, some Mahajans are also Aratdars or vice versa.

**Gura fish**

Chain 1: Fisher $\Rightarrow$  Mahajan $\Rightarrow$ Aratdar $\Rightarrow$ Auctioneer $\Rightarrow$ Wholesaler $\Rightarrow$ Retailer
Chain 2: Fisher $\Rightarrow$ Choto Mahajan $\Rightarrow$ Boro Mahajan $\Rightarrow$ Aratdar $\Rightarrow$ Wholesaler $\Rightarrow$ Retailer
Chain 3: Fisher $\Rightarrow$ Faria $\Rightarrow$ Mahajan/Aratdar $\Rightarrow$ Wholesaler $\Rightarrow$ Retailer
Chain 4: Fisher $\Rightarrow$ Mahajan $\Rightarrow$ Aratdar $\Rightarrow$ Company/Exporter

**Sada (White-Large) fish**

Chain 1: Fisher $\Rightarrow$  Mahajan $\Rightarrow$ Aratdar $\Rightarrow$ Auctioneer $\Rightarrow$ Wholesaler $\Rightarrow$ Retailer
Chain 2: Fisher $\Rightarrow$ Choto Mahajan $\Rightarrow$ Boro Mahajan $\Rightarrow$ Aratdar $\Rightarrow$ Wholesaler $\Rightarrow$ Retailer
Chain 3: Fisher $\Rightarrow$ Mahajan $\Rightarrow$ Aratdar $\Rightarrow$ Auctioneer $\Rightarrow$ Wholesaler $\Rightarrow$ Retailer
Chain 4: Fisher $\Rightarrow$ Mahajan $\Rightarrow$ Aratdar $\Rightarrow$ Company/Exporter

**Hilsha**

Chain 1: Fisher $\Rightarrow$ Mahajan $\Rightarrow$ Aratdar $\Rightarrow$ Auctioneer $\Rightarrow$ Wholesaler $\Rightarrow$ Retailer
Chain 2: Fisher $\Rightarrow$ Bahaddar $\Rightarrow$ Auctioneer $\Rightarrow$ Wholesaler $\Rightarrow$ Retailer
Chain 3: Fisher $\Rightarrow$ Mahajan $\Rightarrow$ Aratdar $\Rightarrow$ LC party /Exporter

**Fish (Shrimp) fry (galda and bagda)**:

Chain 1: Fry collector $\Rightarrow$ Faria/Bepari $\Rightarrow$ Mahajan $\Rightarrow$ Aratdar $\Rightarrow$ Nursery $\Rightarrow$ Retailer

Almost in all the cases, Choto Mahajans or Boro Mahajans organize the collection job while the collectors work on only wages to sell their collected products at some fixed or reduced price. As in other cases, collectors sell their products to Choto Mahajans or Boro Mahajans and some also sell their products directly to Aratdars or wholesalers. The basic structure being the same or similar, in the case of exports, Aratdars sell their fish products to exporters.

**Aquatic Resources**

**Crab**
Chain 1: Collector $\Rightarrow$ Mahajan $\Rightarrow$ Aratdar/Depot $\Rightarrow$  Exporter

**Mollusc/Shell/Oyster**
Chain 1: Collector $\Rightarrow$ Mahajan $\Rightarrow$ Miller $\Rightarrow$ Fishmeal/Poultry Wholesaler $\Rightarrow$ Retailer

In the case of mollusc/shell/oyster, millers constitute a major actor who manufactures fishmeal or poultry feed.

**Non-Aquatic Resources**

**Honey**:
Chain 1: Collector $\Rightarrow$ Faria/Bepari $\Rightarrow$ Mahajan $\Rightarrow$ Wholesaler $\Rightarrow$ Retailer
Chain 2: Collector $\Rightarrow$ Mahajan $\Rightarrow$ Wholesaler $\Rightarrow$ Retailer

Although sometimes honey is also exported such purchases are made directly from wholesalers.

**Mapping for Total Number of Actors in SIZ**

There are about 159 such centers for different products across 10 upazilas of 5 SIZ districts[14]. The total number of collectors estimates as 10.8 lacs and the total number of actors estimates as 13.37 lacs. (Table 3). However, our investigation indicates that an average collector get engaged in 1.8 products in a year. On this basis, the actual number of collectors' estimates as 6 lacs and the total number of actors estimate as 7.4 lacs. Product wise distribution shows that the highest number of actors is engaged in shrimp fry (galda), followed by shrimp fry (bagda), shrimp (bagda) and Hilsha.

As regards the distribution of total number of actors across districts, Khulna occupies the highest position, followed by Pirojpur, Bagerhat, Satkhira and, the lowest, Barguna.

**Table 3: Estimates of total no. of actors by SIZ district**

| District | Total no. of actors by SIZ districts | | | | | | | Total | % of total | Rank |
|---|---|---|---|---|---|---|---|---|---|---|
| | Collector | Faria/ Bepari | Choto Mahajan | Boro Mahajan | Aratdar | Who lesaler | Retailer | | | |
| Bagerhat | 192843 | 21380 | 14738 | 767 | 1515 | 136 | 4322 | 235701 | 17.6 | 3 |
| Khulna | 393802 | 85519 | 25141 | 1699 | 17319 | 1902 | 5618 | 531000 | 39.7 | 1 |
| Satkhira | 120962 | 8979 | 4335 | 493 | 2814 | 136 | 3890 | 141609 | 10.6 | 4 |
| Pirojpur | 289845 | 17104 | 6936 | 329 | 2165 | 272 | 1729 | 318380 | 23.8 | 2 |
| Barguna | 82702 | 11545 | 7802 | 548 | 2814 | 1359 | 3457 | 110227 | 8.2 | 5 |
| All | 10,80,155 | 1,44,527 | 58,952 | 3,836 | 26,628 | 3,804 | 19,016 | 13,36,918 | 100.0 | - |

**3.3 Mapping for Geographical Flows**

The basis of assessing the product movements in the economy emerges from the assumption that the actors, by and large, are well informed about and geographical destinations of SRF products including their end-use.

According to first-stage movement, the SRF products are traded within SIZ upazilas to the extent more than one third (34.1%), while the proportion that are traded in other parts of the

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[14] This included a few secondary and tertiary markets.

country (e.g. Khulna, Chittagong and Dhaka- presumably some for exports, and other parts of the country) estimates as about little less than two-thirds (63.7%). The traded quantity, directly from SIZ to outside the country, is estimated as about only 2.3 percent (For details see Islam 2010).

### 3.4 Value Chain Analysis for SRF Products

The basic structure of marketing chains for SRF products is shown in Figure 2. The actual marketing chains are found to follow multi-dimensional patterns (Islam 2010).

The core element of value chain mapping is to map the monetary value throughout the chain. It is important to recognize that the collection process and sharing of margins among actors are extremely complex and so is the calculation of costs and returns. The calculation of costs and returns is found to be further complicated when there is no systematic hierarchy among actors and when a single actor is concerned with multi-products. It is revealed that only price information is adequately known at each level, and thus values in terms of price along the marketing chain are the core concerns of this Paper.

**Figure 2: Basic structure of SRF products marketing channels**
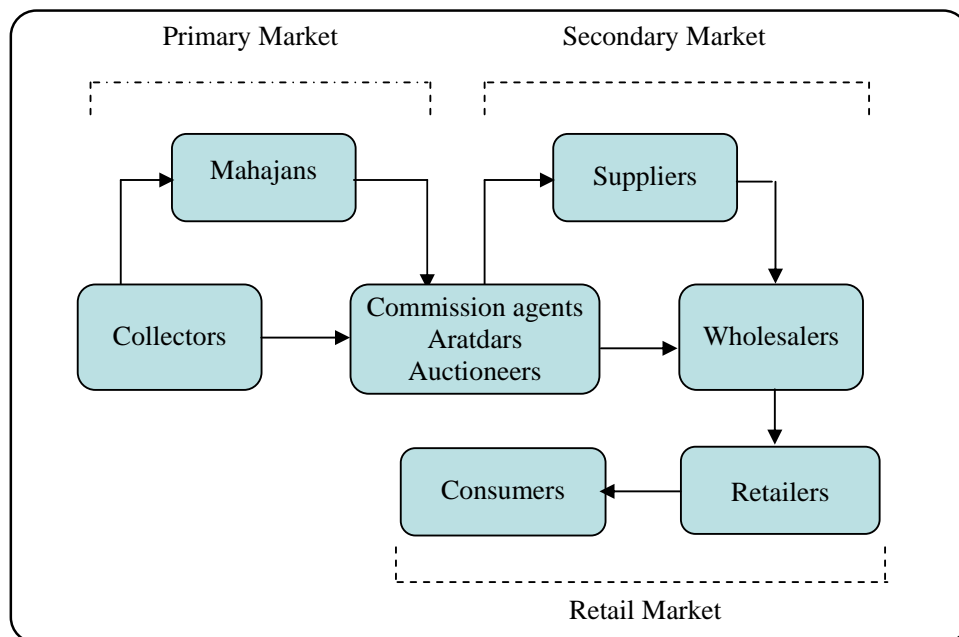


**Golpata**

**Value Additions and Returns**

Looking at values in terms of price, collectors provide the highest value addition (49.7%) of the total price, the price being considered from collectors to consumers (Table 4). Keeping collectors aside, retailers create the next highest value addition (13.7%), followed by Choto

Mahajans (12.7%), Majhis/Beparis (11.2%). Aratdars (6.1%), wholesalers (5.1%) and the lowest for Boro Mahajans (1.5 %)

**Table 4: Value addition (in terms of price) and return for golpata**

|  | Value addition & return | | | |
|---|---|---|---|---|
|  | Value in terms of price (%) | % of average traded volume | % of average Net Return | Net Return as % WC |
| Collector | 49.7 | 0.6 | 2.7 | - |
| Majhi/Bepari | 11.2 | 3.7 | 4.2 | 121.97 |
| Choto Mahajan | 12.7 | 6.6 | 9.0 | 22.67 |
| Boro Mahajan | 1.5 | 27.7 | 36.8 | 23.31 |
| Aratdar | 6.1 | 40.9 | 33.5 | 25.18 |
| Wholesaler | 5.1 | 16.3 | 8.2 | 7.51 |
| Retailer | 13.7 | 4.2 | 5.5 | 12.67 |
| Total | 100.0 | 100.0 | 100.0 | - |

Collectors have net returns less than 3 percent. In absolute terms, the Boro Mahajans and Aratdars have net income 13 to 14 times higher compared to that earned by collectors (Figure 3).

**Gura (Small) Fish**

**Value Additions and Returns**

Table 5 presents costs and returns for gura fish. The collectors provide the highest value addition, nearly two-thirds (viz. 64.6%) of the total price, from collection to consumers. Keeping collectors aside, retailers create the highest value addition (12.3%), followed by Farias (9.2%), wholesalers (7.7%), Aratdars (4.6%) and Choto Mahajans (1.5%).

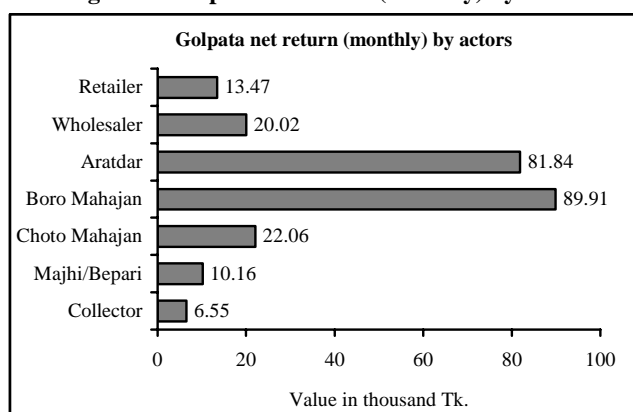**Figure 3: Golpata net return (monthly) by actors**

**Table 5: Value addition in terms of price and return for gura fish**

| | Value addition & return | | | |
|---|---|---|---|---|
| | Value in terms of price (%) | % of average traded volume | % of average Net Return | Net Return as % WC |
| Collector | 64.6 | 0.6 | 3.8 | 72.4 |
| Faria | 9.2 | 4.7 | 6.6 | 12.9 |
| Choto Mahajan | 1.5 | 5.0 | 8.8 | 10.9 |
| Aratdar | 4.6 | 72.7 | 59.4 | 11.1 |
| Wholesaler | 7.7 | 11.8 | 12.2 | 9.1 |
| Retailer | 12.3 | 5.2 | 9.2 | 78.7 |
| Total | 100.0 | 100.0 | 100.0 | - |

Of all the actors, comparatively the Aratdars, again, have the highest net returns (around 59%), followed by wholesalers (around 12%), retailers (around 9%) and Choto Mahajans (9%). Collectors or Beparis have net returns of only around 4 to 6 percent. In absolute terms, the Aratdars have net income 16 times more compared to that earned by collectors (Figure 4).

**Figure 4: Gura fish net return (monthly) by actors**
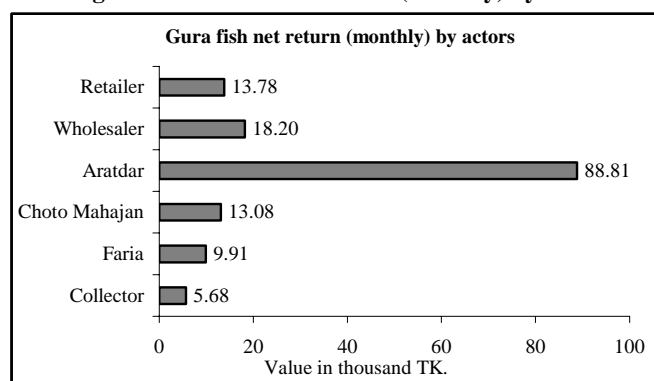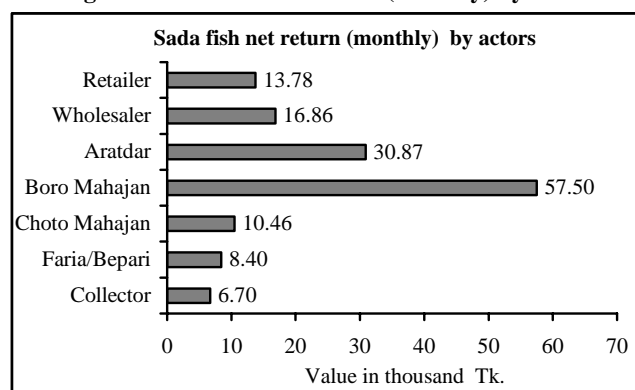


**Sada (white) Large Fish**

In terms of value additions in prices, collectors, obviously, provide the highest value addition, little less than two-thirds (63%) of the total price (Table 6). Obviously, bottom actor such as Farias and collectors were dealt in lowest quantity of trade, 3.2 percent and less than one percent (0.6%) respectively.

**Table 6: Value addition in terms of price and return for sada (large) fish**

| | Value addition & return | | | |
|---|---|---|---|---|
| | Value in terms of price (%) | % of average traded volume | % of average Net Return | Net Return as % WC |
| Collector | 62.5 | 0.63 | 4.6 | 239.4 |
| Fariha/Bepari | 11.5 | 3.2 | 5.8 | 56.0 |
| Choto Mahajan | 1.0 | 3.8 | 7.2 | 66.6 |
| Boro Mahajan | 1.0 | 18.2 | 39.8 | 45.4 |
| Aratdar | 4.0 | 41.2 | 21.4 | 6.4 |
| Wholesaler | 4.5 | 25.3 | 11.7 | 12.0 |
| Retailer | 15.5 | 7.6 | 9.5 | 103.4 |
| Total | 100.0 | 100.0 | 100.0 | - |

In terms of proportions, the Boro Mahajans, again, have the highest gross or net returns (around 31-39%). For the Aratdars, as usual, the proportions are also high, gross and net returns being in the range of 21 to 23 percent. In proportional terms, collectors or Beparis have gross or net returns of only around 5 to 6 percent. In absolute terms, the Boro Mahajans have net income around 9 times as much compared to that earned by collectors (Figure 5).

**Figure 5: Sada fish net return (monthly) by actors**



**Hilsha**

Collectors provide the highest value addition in terms of price, a little less than two-thirds (63%) of the total price (Table 7). Obviously, bottom actors such as Majhis and collectors were dealt in lowest quantity of trade, 4.6 percent and less than one percent (0.5%) respectively.
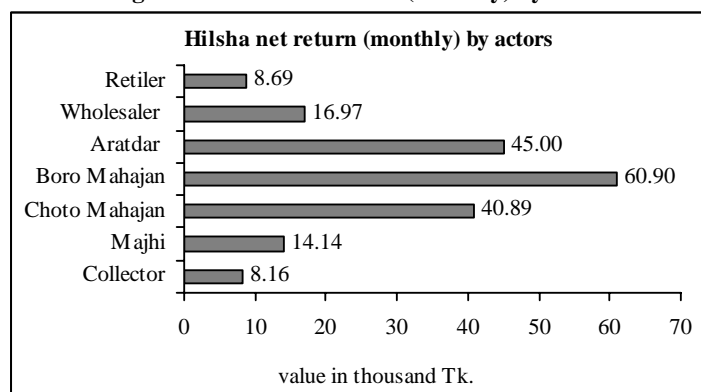
**Table 7: Value addition in terms of price and return for hilsha**

|  | Value addition & return | | | |
|---|---|---|---|---|
|  | Value in terms of price (%) | % of average traded volume | % of average Net Return | Net Return as % WC |
| Collector | 63.3 | 0.47 | 4.2 | - |
| Majhi | 10.0 | 4.6 | 7.3 | 91.2 |
| Choto Mahajan | 8.3 | 5.5 | 21.0 | 59.8 |
| Boro Mahajan | 1.0 | 17.0 | 31.3 | 21.3 |
| Aratdar | 2.7 | 50.5 | 23.1 | 12.3 |
| Wholesaler | 2.3 | 19.9 | 8.7 | NA |
| Retailer | 12.3 | 2.0 | 4.5 | NA |
| Total | 100.0 | (100.0) | (100.0) | - |

In terms of proportions, again, Boro Mahajans (31.3%), Aratdars (23.1%) and Choto Mahajans (21.0) are the highest beneficiaries. Collectors or Beparis (Majhhi) have net returns of only around 4 to 7 percent. In absolute terms, the Boro Mohajans have net income more than 7 times as much compared to that earned by collections (Figure 6).

**Other SRF Products**

Similar findings are revealed for shrimp large (galda or bagda), crab, and honey.

**Figure 6: Hilsha net return (monthly) by actors**



**Hilsha net return (monthly) by actors**

| Actor | Value |
|---|---|
| Retiler | 8.69 |
| Wholesaler | 16.97 |
| Aratdar | 45.00 |
| Boro Mahajan | 60.90 |
| Choto Mahajan | 40.89 |
| Majhi | 14.14 |
| Collector | 8.16 |

value in thousand Tk.

**Table 8: Income distribution and income inequality among SRF products**

| SRF Products | Proportion of income (%) at | | Proportion of Deciles 1 to 10 | Gini coefficient |
|---|---|---|---|---|
| | Bottom half (Deciles 1 to 5) | Top half (Deciles 6 to 10) | | |
| Golpata | 16.6 | 83.4 | 1 : 21 | 0.51 |
| Gura fish | 14.2 | 85.8 | 1 : 34 | 0.53 |
| Sada (white) large fish | 20.3 | 79.7 | 1 : 19 | 0.44 |
| Hilsha | 16.4 | 83.6 | 1 : 43 | 0.48 |
| Shrimp large (galda) | NA | NA | NA | NA |
| Shrimp large (bagda) | NA | NA | NA | NA |
| | | | | |
| Shrimp small (Galda) | NA | NA | NA | NA |
| Shrimp small (bagda) | NA | NA | NA | NA |
| Shrimp fry (galda and bagda) | 21.5 | 78.5 | 1 : 41 | 0.44 |
| Crab | 15.5 | 84.5 | 1 : 35 | 0.52 |
| Honey | 22.2 | 77.8 | 1 : 17 | 0.40 |
| All SRF products | 15.5 | 84.5 | 1 : 29 | 0.52 |
| Bangladesh (HIES 2010) | 20.3 | 79.7 | 1:18 | 0.46 |

**Distribution of Actors Income – Income Inequality**

The mean incomes across actors in the value chain have been estimated disaggregated by SRF products[15]. Annual incomes are estimated from monthly incomes by incorporating peak and non-peak months. Non-peak months have been standardized by adjusting with days worked in a month. However, mean income does not demonstrate the whole story about income or income poverty. One also needs to look into the distribution of income. Hence, the

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[15]  The income denotes from SRF sources alone. The incomes from other sources, if any, have not been incorporated in the analyses.

distribution of actors' average income (on per capita income scale) by the deciles of actors is determined, focusing on inequality of income. Inequality is an important social issue and defined as the proportion of average income to total income earned by all the actors.

Out of the several actors, the value of income for the two extreme groups, namely the collectors and Aratdars (or Mahajans) have been compared to quantify the extent of inequality. Gini coefficient, which is a good indicator of measuring inequality, is estimated for each SRF product (Table 8) (See also Figure 7)[16]. We start with golpata.

**Golpata**

The degree of inequality is quite high in that the average annual income earned by the collector category is found to be more than 16 times as less as earned by an Aratdar. Considering two deciles, Decile 1 for the bottom-ranking actors and Decile 10 for the top-ranking actors, it can be seen that the top 10 percent of the actors earn 21 times as much income as the bottom 10 per cent (1:21). Gini coefficient for golpata estimates as 0.51, which is quite high.

**Gura (Small) Fish**

The average annual income earned by the collectors, for example, estimates 13 times as less as earned by an Aratdar. In terms of deciles distribution, the top 10 percent of the actors earn as high as 34 times as much income as the bottom 10 percent (i.e.,1:34). Gini coefficient for gura fish estimates as 0.53, which is again quite high.

**Sada (large) Fish**

The average annual income earned by the collectors estimates as more than 10 times as less as earned by an Aratdar. Gini coefficient for Sada (large) fish estimates as 0.44, which is a bit lower compared to most other SRF products.

**Hilsha**

The average annual income earned by the collectors estimates as nearly 8 times as less as earned by a Boro Mahajan. Considering two deciles, the top 10 percent of the actors earn as high as 42 times as much income as the bottom 10 percent (i.e.,1:43). Gini coefficient for hilsha fish estimates as 0.48, which is a bit lower compared to gura and sada fish.

Similar is the pattern of inequality in the value chain for shrimp large (galda and bagda), shrimp small (galda and bagda), crab and honey

**SRF Products: All combined**

Taking all SRF products together, the average income earned by an Aratdar or a Mahajan is found to be nearly 5 to 7 times as much as earned by a collector. Inequality is demonstrated in that the income of a collector constitutes, in terms of total income of all actors, only 4.9 percent, followed by Majhis/Beparis (9.5 %), Choto Mahajans (9.2 %),  Boro Mahajans (23.9 %), Aratdars (31.9 %), wholesalers (14.5 %) and retailers (6.6 %).

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[16] Because of small sample size, the results on gini coefficients should be used with care.

**Table 9 : Annual income level of SRF Actors: All products**

| Actors | Annual Income (SRF product) | % |
|---|---|---|
| Collector | 53632 | 4.90 |
| Majhi/Bepari | 98936 | 9.05 |
| Choto Mahajan | 100361 | 9.18 |
| Boro Mahajan | 261664 | 23.92 |
| Aratdar | 349197 | 31.93 |
| Wholesaler | 158195 | 14.46 |
| Retailer | 71813 | 6.57 |
| Total | 1093799 | 100.00 |

Note: Non-peak months are standardized with corresponding number of days worked.

The degree of inequality has been worse in some activities than the others. Ironically, the sample collectors earn net returns in the range of only 3 to 7 percent while they create price value additions by as high as 50 to 75 percent, depending on the products. Intuitively, given the existing economic situation, SRF extraction is deepening poverty levels, which may help widen the income gap between rich and poor.

So far the incomes from SRF products are concerned, the income distribution appears to be highly skewed in the SIZ area. While the bottom half (Deciles 1 to 5) of the actors have 15.4 percent of the total income, the top half (Deciles 6 to 10) of the actors accounted for as much as 84.5 percent of the total income. Considering two deciles, Decile 1 for the bottom-ranking actors and Decile 10 for the top-ranking actors, the proportion of decile1 to decile10 is as high as 1:29.

**Figure 7 : Annual income level (%) of SRF actors: All products**
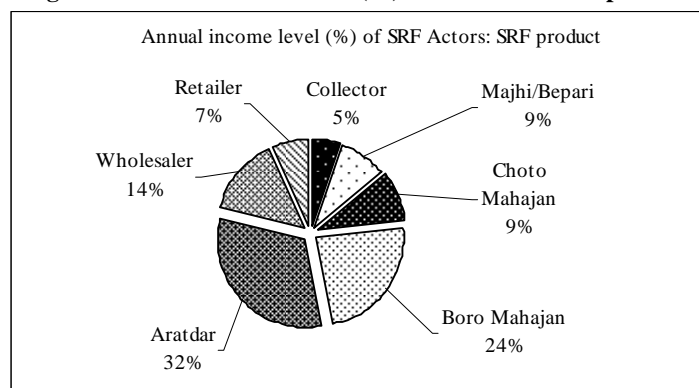


Thus, the Gini coefficient for measuring income inequality in the SIZ area as a whole is estimated as 0.52 (Figure 8), as compared to that of Bangladesh, as a whole, which is 0.46 (HIES 2010). Considering two deciles for Bangladesh, as a whole, the proportion of decile1 to decile10 is 1:18.

As was evident from previous section, the Gini coefficients for individual products are estimated in the range of 0.40 to 0.53. In this context, one can mention findings from a BIDS study (Islam et al 2009). It was found that in the coastal districts the Gini coefficients vary from 0.19 to 0.36. In no cases, Gini coefficients for any of the coastal districts are higher than or close to that in the SIZ area. In fact, the coefficients in the SIZ estimate much higher, indicating that so far the SRF actors' income is concerned the SIZ area is characterized by severe inequality in income.

**Figure 8: Income inequality – All SRF products**
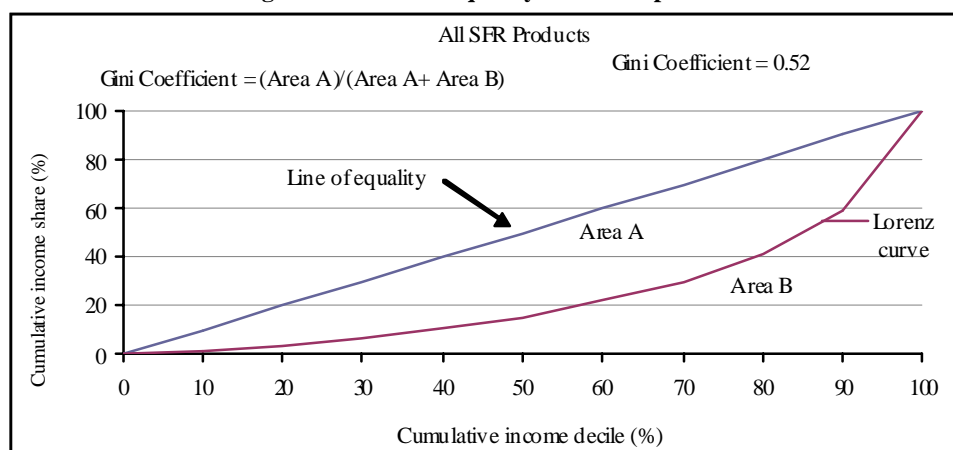


## IV. POLICY IMPLICATIONS

This section reviews the major findings, and relates them to a few major issues. The issues may crucial to the improvement of value chains, in terms of return and equity, conservation and co-management, and overall improvement of the quality of life of the people involved with SRF resource collection. It also suggests for policy implications and discusses relevant interventions[17].

### 4.1 Pressure on SRF and Poverty Situation

The increased population with few alternative livelihood opportunities poses a serious threat to the Sundarbans which is the main cause of mangrove destruction. Moreover, dependence of local people on the forest is high (28% of the population in the impact zone are dependent on the forest) and in future this dependence will increase, which is likely to aggravate the existing pressure on the government mechanisms for forest management and protection.

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[17] The identified interventions may not all be feasible and implementable in the short run, but reported here only to reflect the views of the respondents of the study surveys, FGDs, Case Studies and Problem Analyses.

There are more than one million people directly involved with the resources extraction from the SRF[18]. The pressure on SRF for resources extraction has increased tremendously as the number of collectors has increased many fold over the last decades, resulting in huge reduction in per capita resource collection from the SRF[19]. With the high increase in living cost added to that scenario, the people and the community, especially that of the bottom layer actors in the value chains tend to fall in the process of pauperization.

The Paper demonstrates a very dismal picture on poverty levels in the region. The  SIZ upazilas have a much higher (extreme) poverty rates (0.42) compared to an average non-SIZ upazilas in Bangladesh (0.26). In fact, nine out of ten SIZ-upazilas (except Patharghata, Barguna), have a much higher extreme poverty levels than the corresponding non-SIZ upazilas of five SIZ districts, in terms of Head Count Ratio (HCR)[20].

The average monthly income of the SRF harvesters is in the range of TK 5,000 to 6000 only during harvest seasons. There are months when they have hardly any income at all. The study demonstrates huge income inequality among actors. The top 10 percent of the SRF actors earn as high as up to 43 times as much income as the bottom 10 percent (Estimated Gini coefficients for various SRF products range from 0.42 to 0.53, which are on a much higher side in Bangladesh context). Thus, poverty and income inequality situations in the SIZ are severe, which have immense policy implications.

The foremost policy, therefore, will be to address the poverty of the bottom layer forest resource actors which will effectively help the management and conservation of the SRF. To sum up, as the Problem Analysis demonstrates, this demands a special attention because of the following:

- The SRF collection quantity has significantly declined. Some of the species are getting rarer. This is more so in fishery sector[21] and that is why the fishery sector demands a special focus.

- Number of harvesters (e.g. fishermen or golpata collectors) increased many fold (present study estimates over 0.9 million fish collectors, most of which are fisher laborers.

- Because of gradual displacement from agriculture due to increased salinity more number of people are pouring into SIZ as collectors. Most SRF extractions are

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[18] The involvement of more than one million people (1.07 million) in various SRF extractions over the whole year, however, comprises overlaps across extraction of various products, a large majority of which are fishers including about 2 lacs of shrimp fry fishers. If it is assumed that on an average a collector harvests 1.8 products over the whole year then the number of SRF collectors estimates as about 0.59 million (Section 4).

[19] This is true especially for fishers following that the extraction of other products is highly seasonal and the pressure on the fishery sector is becoming more and more acute.

[20] Based on Cost of Basic Needs (CBN) method, the present study made the estimates incorporating BBS-2005 data that are yet to be published.

[21] In fact, so far as BBS (*Fisheries Statistical Yearbook of Bangladesh, 2007-08)* is concerned, fish production has increased (at the rate of 6.3% for SRF and 6.5% for the country as a whole, per year, based on data for 1998-99 to 2007-08. But due to increased pressure on the fishery sector per capita catch has declined.

merely seasonal and consequently there is high pressure on the fishery sector for subsistence and per capita collection has been reduced to a large extent.

- The major income share of the harvesters is taken away by the higher level intermediaries such as the Mahajans or the Aratdars due to dadons. Dadons and poverty operate in a vicious circle.

- Transportation cost, especially for the fishers, is very high. And the time needed for the transportation/collection is also long to render the collectors more vulnerable.

- One of the major extraction costs is due to ransom to the pirates, and unofficial payments to officials of various departments.

### 4.2 Improving the Value Chains and Poverty Situations of SRF Actors
### Credit and Financial Support

Access to capital has been the most crucial issue, especially among the collectors. Although dadon is a source of exploitation for the collectors they are hardly left with other choices. There are two major reasons for which they take dadons; (1) dadons are easily accessible and available in adequate amounts and (2) dadons provide immense support during lean periods. Dadons act as physical, social and financial safety.

However, the bottom layer SRF actors such as harvesters and Farias are locked into contracts that perpetuate this cycle of debt. A pertinent question is how to break or whether to break the system. Nevertheless, as it is difficult to break the deep-rooted dadon system the positive and negative sides to this business need to be considered when planning new interventions geared at improving value chains.

### Access to Capital - Setting up of Specialized Banks and Specialized Programmes

Government should recognize Sundarbans Reserved Forest (SRF) as a separate and important economic sector, just as Agriculture or Industries, as SIZ consists of more than 10 million people. Specialized banks or specialized micro-credit organizations are to be set up to save the harvesters of the Sundarbans. Like agriculture loans, share cropper loans and SME loans programmes some credit programmes need to be lunched where SRF actors should be given a special attention. The central bank can take initiatives in this respect[22].

### Service Centers and Financial Support

Pending the establishment of the Specialized Bank, a few selected public and private banks in the SIZ should be requested to set up SRF service centers/SRF cells to channel funds to the SRF sector and to cater the special needs of the SRF actors, especially the harvesters in a better way and on softer terms. Collateral free loans should be considered for the collectors. Even the Mahajans or similar other actors should be encouraged to access credits with boats/nets kept as collaterals, the impacts of which are expected to be trickled down to collectors.

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[22] Only recently, the Central Bank launched several credit programs to support agriculture, in general, and share croppers in particular.

**Targeting Programs**

The banks should fully consider the issues and realities of the harvesters and set their policy and procedures accordingly. They should target programs to providing social securities and safety-nets to the collectors, along with adequate amount of credits for the collectors on favorable terms. The banks can also help promote the effort of conservation while sanctioning loans. Repayment schedules and horizons should be flexible to reflect the likely cash flow of the activities in question[23].

**4.3 Improving Terms of Trade and Marketing System**

There are many ways of debt repayment in practice - repayment in cash with interest (47.6%) or without interest (4.0%), repayment in goods at market price (16.7%) and repayment at reduced market price (33.3%). The collectors have to sell their collected products at a price reduced by up to 22.5 percent compared to prevailing market price, depending on the products under study. There can be several ways of improving terms of trade and marketing systems for the SRF products.

Transportation and Storage/Depot Facilities

One important way to minimize transportation costs is to foster and expand spot markets and auctions, which will also ensure offering lower level actors higher prices[24]. Increasing the number of depots and landing places could also minimize the transaction costs and the time for transportation to ensure that the returns are evenly distributed.

Enhancing Bargaining Power of the Collectors

The harvesters particularly the fishermen and crab fishers cannot negotiate price as the fish products are purchased by the Aratdars through Mahajans or Paikars. Enhancing bargaining power of the harvesters is imperative.

Access to Market Information

Better access to the current market information has to be ensured. Barriers to entry, poor infrastructure, inadequate communications, and high transaction and transport costs make the markets in favor of buyers.

Collectors' Organization

One way of reducing vulnerability of the lower layer actors of value chains is to organize Groups or Cooperatives, similar to that of the higher level intermediaries such as Aratdars. This would also help create storage, post-harvest processing, refrigeration facilities, and encourage shared transportation on a collective basis.

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[23] Like what was taken up with SMEs, Bangladesh Bank can take the initiatives in this respect through, for example, launching refinancing schemes.

[24] This was also suggested by a USAID (2006) study.

**4.4 Co-management and Conservation of the SRF**

That sustainable use of the mangrove forest would yield higher welfare benefits than any other activities towards its development is well documented. A decision to develop SRF would be "extremely damaging, not only to current population's welfare but for the future generations as well"[25]. This merely highlights the importance of protecting the SRF. While Integrating Protected Area Co-management (IPAC) has enthusiastically initiated the process of protecting the environment through co-management, further mobilization of the grass-root level people is necessary for the success of the approach. The effective integration of the interests and priorities of the local people into forest management and above all, coordinated efforts appear to be important. More importantly, the stakeholders, particularly the bottom layer actors have to be offered adequate compensation and livelihoods. However, without strong participation of the LGIs, the conservation of the SRF through co-management may not be successful and sustainable. Strong policies are also necessary for the UPs to function independently apart from enhancing their capacities.

Almost all actors along the value chain, particularly the collectors and Mahajans, are affected by ransom and other unofficial payments to various departments, which dramatically increases their costs of harvests, accounting for 10 to 25 percent of total costs of production, depending on products. As well recognized in many documents (e.g. AGRIFOR Consult (2008): SEALS), the shortage of personnel and equipment in the FD is a major constraint in protecting the forest from illegal harvests and protecting the collectors from forest and river pirates.

The actors' community appears to be not much aware of the conservation issues, risk of degradation, and the importance of the Sundarbans. Undertaking more campaign programs by appropriate authority (in collaboration with local LGIs and NGOs) on the importance of conservation and related forest rules would also be a step forward. Campaigns on public awareness in creating safe habitat for fish and conserving fisheries resources need careful attention.

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[25] See, for example, Landell-Mills (1995).

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