

Status of Stakeholders at Different Level of Marketing Channel of Shrimp in Khulna Region



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Status of Stakeholders at Different Level of Marketing Channel of Shrimp in Khulna Region

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By

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Dedicated
To
My Beloved Parents

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All praises are to the Supreme Being Creator and Ruler of The Universe, Almighty “Allah” whose compassion retains me on the earth and enable me to continue my education in Fisheries and Marine Resources Technology Discipline and complete the project thesis. I adore and remember Him at first from the core of my heart.

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ABSTRACT

This study was undertaken to assess socio-economic status of the stakeholders in shrimp marketing channel in Khulna region. The investigation initially identified the marketing channels and the stakeholders. The study covered the areas of Bagerhat, Khulna and Satkhira districts and included 13 upazillas, 152 ghers, 86 farias, 210 depots, 22 agents and 8 processing plants. The investigation initially identified the marketing channels and the stakeholders. Transportation from harvest to processing plant was unsatisfactory in relation to materials, carriers and routes and the average handling period was 8 hours. Stakeholders mostly were Muslims and were either illiterate or had primary education. Shrimps were washed with water taken from ghers, rivers/canals by farias or in depots while shallow and deep tubewells were mostly used in agents and processing plants. Ratio of ice to shrimp used varied widely. In most cases icing was done in the Depot rather than from the point of harvest (Ghers). Salary of the workers (Ghers, Depots) was poor but relatively higher in agents and processing plants. Grading of shrimp in Depot was mostly done in wooden or tin platform. Organoleptic score of shrimp were moderate to highly acceptable in all points of marketing. The agents exercised an exceedingly powerful role. Government and NGO's should intervene to minimize the powerful role of the agents through an acceptable strategy. This will lead to improving the livelihood and better communication between the other stakeholders. Each stakeholder should come under one apex body and must comply with all the requirements set by shrimp seal of quality (environment friendly, traceability, food safety, HACCP implementation, human rights violation) as desired by buyers in the international market.

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ABBREVIATIONS

ATDP	=	Agro-based Industries and Technology Development Project
BGA	=	Brilliant Green Agar
BGLB	=	Brilliant Green Lactose Bile Broth
BSA	=	Bismuth Sulphate Agar
EMB	=	Eosin Methylene Blue Agar
FC	=	Faecal Coliform
GO	=	Government Organization
HACCP	=	Hazard Analysis Critical Control Point
HEA	=	Hektoen Enteric Agar
KIA	=	Kligler's Iron Agar
LSTB	=	Lauryl Sulfate Tryptose Broth
NGO	=	Non Government Organization
SPC	=	Spread Plate Count
TC	=	Total Coliform
TCA	=	Trichloro Acetic Acid
TCBSA	=	Triosulphate Citrate Bile Salts Sucrose Agar
TMA	=	Trimethyl Methyl Amine
TMA-N	=	Trimethyl Methyl Amine Nitrogen
TMAO	=	Trimethyl Methyl Amine Oxygen
TVB	=	Total Volatile Bases
TVB-N	=	Total Volatile Basic Nitrogen
XLD	=	Xylose Lysine Deoxycholate



1.0 INTRODUCTION

Bangladesh is situated in the south-east part and has an area of 144,000 sq. km land. Bangladesh is fortunate enough having extensive water resources scattered all over the country in the form of ponds, beels (natural depressions), lakes, canals, rivers and estuaries. There are about 735 species of fish and 48 species of shrimp available in the fresh and marine waters of Bangladesh (Mazid, 2002). The total fish production in Bangladesh during the year 2001-2002 was 1,890, 459 metric ton. Bangladesh is rich in inland and marine water resources which can be effectively tapped for fisheries development, thereby solving the impending protein deficiency. Domestic consumption of fish and other shell fish for human food in Bangladesh was about 12 kg per annum in 1962-63. But due to population explosion and man made causes total fish production continue to decline from 1975-76 till 1985-86, resulting in reduced per capita consumption (Hussain and Uddin, 1995). Consumption of 7.6 kg per head per annum is low compared to most countries of the world. However, in Bangladesh fish accounts for about 80% of total consumption of animal protein. Scarcity of fish is therefore a major factor contributing to protein deficiency which is believed to affect 80% Bangladeshi households. Scarcity of fish in Bangladesh together with scale of losses makes it particularly important to improve the way in which fish is marketed.

Khulna region, in South Western part of Bangladesh has big potential and for contribution in fisheries. There are a total of 176989 ponds covering an area of 14070 ha. Greater Khulna region has 62 baors that 4623 ha of water. The rivers and the coastal waters in Khulna Division a total of 232405 ha. The total number of fishermen in this area is proximately 75249. The demand of fish /head /day in this region (calculated on the basis of demand of 38 gm/head/day) is 207104 MT. There is a shortage of production of 65408 MT of fish in this region. Khulna region has been specially important being endowed with yet another big fisheries resources from the water area (169972 ha) of the world largest mangrove the 'Sundarbans' (Fatema, 1998) /

Shrimp farming is key to the country of Bangladesh. The shrimp sector is the second largest export industry. There are 600,000 people employed in the shrimp sector in Bangladesh generating US\$ 301 million annually, from Bagda and Galda farms (US\$243 million from bagda alone. The combined production from marine and brackish water ponds and fresh water ghers is estimated to be around 42,900 mt (unprocessed weight), 76% being *Penaeus monodon* tiger shrimp (known locally as bagda) coming from

extensive aquaculture and 24% galda (*Macrobrachium rosenbergii*) from inland farming. The total area under production is estimated to be equivalent to 200,000 ha of which 170,000 ha is aimed at the production *P. monodon* culture, whilst the remaining 30,000 ha. is for *M. rosenbergii*. This compares with a total 52,000 ha and 3,500 ha in the mid 1980s respectively. The total production area is believed to have expanded by approximately 20 per annum in the last 15 years. However, despite the comparative lower levels of production of *Macrobrachium*, the growth in this species production has more than doubled over the same period.)

In the national export earning, shrimp and other fishes contributed about 5% of the total, shrimp alone contributes about 95%. Although the present contribution of shrimp is already huge, it is noting more than a small part of its full potential. Also the present production level of shrimp is the lowest in the world and immensely lowers than Thailand, India, Vietnam, China and Indonesia. So Bangladesh has tremendous potential for both vertical and horizontal expansion of shrimp farming. Increasing the production several fold from such a low base line should be possible if adequate infrastructure and technological supports are provided. We have a processing capacity of 2,56,000 metric tones of shrimp in our 127 plants. Starting with a merge export earning of US\$ 3.17 millions in the year 1972-1973 the country has earned a US\$ 363 million in 2000-2001 and US\$ 276.11 millions in 2001-2002. (DoF, 2002)

Shrimp fishing and related activities provide incomes for huge numbers of people. Shrimp not only provide a crucial source of protein in the country with growing rural and urban populations, but they also offer a primary and secondary income for sub sector increasingly involved in auxiliary activities. A considerable proportion of the population in country with shrimp resources relies directly on the shrimp for employment. The role of shrimp in generating employment opportunities among groups with limited access to resources has been under stressed. In fact, numerous and diverse opportunities exist for groups such as traders, farias, aratdars(depot owners), family members involved in processing, ice sellers, lorry drivers and basket makers etc. shrimp fishing provides fishing a livelihood for many of he rural people, either full time or a seasonally.

The word 'Marketing' compliment distribution channel as has been described in the present study. Different researcher has viewed marketing in different ways and the changing focus of marketing is reflected in the multiplicity of marketing viewpoints. (Crosier, 1975). Marketing is the business function that identifies an organization customer needs and wants, determines, which target markets it can serve best and designs appropriate products services and programs to serve those market. However,

marketing is much more than just an isolated business functioning. It is philosophy that guides the entire organizations. The goal of marketing is create customer satisfaction profitably by building value- laden relationship with important customers.

Fish has peculiar feature of its own and gives a big strain and stress on the method of its marketing. The fish landing centers are invariably isolated from markets, which mean supplies during peak season in those areas adequate demand. The improvement in fish marketing and distribution can vary well eliminate some of the depressed products of malnutrition where people live on subsistence level by supplying fish at reasonable prices. Hence, fish marketing should have the wide scope for exploitation, distribution, preservation and transportation of fish in addition to actual scale of fish reducing middle man. Fish marketing also include the important place i.e. fish market.

There is a wide gap between the supply and demand of fish in our markets. The marketing system comprises a market and distribution channel along with packaging, transportation and storage facilities. The growers and fishermen are compelled to sell their catch to different intermediaries at a price determined by the latter. The demand for fish remains relatively constant throughout the year, but it is observed that a variation in production scale has a great impact on price. The 'gross profit margin' and margin ratio are two important aspects in analyzing market activity. Different costs in marketing include transportation, depreciation, polythene, rope, chat, aratdars commission and incidental and market tolls. Among the fish traders, the agents obtained the highest net profiting comparison with other traders in the distribution chain. In the present marketing system the grower mostly received less then 50% of the price by consumers. Such as inadequacy of storage and preservation facilities, inefficient transporting systems; relevance of market price, absence of cooperative marketing system and inadequate financing of the fishermen and fish negatively affected the marketing system.

! Fish marketing in small fishing communities traditionally operates under priority enterprise in winch the trader plays a dominant role. This functionary (agent) has potential monopolistic and monosonistic qualities which survive because of the needs of small-scale fishermen for short-period borrowing. This system claimed, yields for the fishermen only a low price for his fish.)

Bangladesh currently accounts for 2.5% of the global shrimp production. The shrimp sector has a share of 14% in pisciculture farms and 4% in the total agricultural employment in the coastal zone (BBS, 1999, Frankenberger, 2002). The sector annually generates 16 million person days of wage labor (BCAS, 2001)

Shrimp transported after harvest takes about 8-12 hours to reach processing plant. The post harvest flow goes from farmer to faria to small depot to large depot to agent and to processing plant. The agents buy the entire product pre-sale to the factory. A few large depots purchase shrimp directly from gher. Farias generally trade with smaller farmers. Some large- scale farmers sometime bypass the farias and supply direct to the depots or even to the agents. There are no direct links between farmers and processing plants. Processor provides a commission to agents who compete for supplies at the depots. The agents subsequently use this finance as capital for lending. Usually the agents exert influence at both ends of the scale. The agents largely fixed the prices.

Once considered as a low-grade food item, shrimp has been elevated to a higher status with the opening of the world market. Employment in the shrimp sector is estimated at about 840,000 persons (Frankenberger, 2002). Table 1, Presents a summary of employment for different livelihood groups in the shrimp distribution channel (Banks, 2002).

Table 1: Distribution of employment for different livelihood groups

Livelihood groups	Labor
Fry collector	444,000
Fry faria	5,176
Traders/faria selling wild fry to farm	1,791
Hatcheries	1,845
Shrimp farms	266,485
Shrimp faria	5,293
Shrimp Depot	4,349
Processing factory	9,780
Commission agent	500
Feed factories	230
Total	739,449

Wild fry collectors are the major livelihood groups in terms of number (Govt. has recently banned wild fry collection), followed by persons involved in the shrimp distribution channel (BCAS, 2001).

There are scanty information's on the shrimp distribution (marketing) channel and the status of stakeholders of the channel at each point in Khulna region. The study therefore focused on the livelihood status of the stakeholders and quality of shrimp at each level of marketing channel.

2.0 REVIEW OF LITERATURE

Fishermen are the main forces behind harnessing the enormous fishery resources. Fisheries provide livelihood to about 12 million people of Bangladesh directly or indirectly. This figure is about 12% of the total population of the country (Chowdhury, 1993). Fisheries have contributed to 5.24% to GDP, 5.3% to national income, 4.76% foreign exchange earning (Matshay Pakkha, 2003).

Fishermen and their families in south and Southeast Asia are often considered among the poorest of the poor (Bailey, 1994).

Fisheries activities are considered as a low-class profession and fishermen are traditionally poor. They live from hand to mouth (Hannan, 1984). These fishermen are socially, economically and educationally disadvantaged communities and lack their own financial resources (Rahman, 1994). Fishermen and their families in the South and South East Asia often are considered to be among the poorest of the poor (Bailey, 1994).

In Bangladesh, most of the fishermen are illiterate and few have primary level of education (Rahman, 1994a; Bailey and Doulman, 1994). Only about fifteen percent of them are literate. Their per capita income and living standard are at the lowest ebb (Chowdhury, 1994).

Systems of fish distribution vary greatly around the world and within the country itself. Factors which determine the fish/ shellfish distribution system are socio-economic variables, production functions and the end use of fish/shellfish (Lowson, 1984).

Fishermen may organize themselves into fishermen's associations, fishermen's co-operatives or trade unions to enhance their marketing bargaining power and to influence marketing structures to their own advantage (Brockmann, 1983).

Ruckes (1980) provides a check list of possible sources of constraints in the domestic marketing system, considering these as arising not only from producers and traders but also from administrators and policy makers.

Causes of variation in the roles of intermediaries make it very difficult to draw up, even for each country, a comprehensive list of functions and status of each individual concerned in marketing and distribution of fish and shellfish (Lawson, 1972).

In India there are six principal types of market intermediaries i.e. auctioneers, commission agents, wholesalers, retail commission agents, retailers and vendors. The

distribution of fish appeared to vary according to the spatial distance between producer and consumer (Bobb, 1982).

The khuchra bepari i.e. suppliers, are tied to agents and are forced to struggle against uneven odds and are predominantly committed to buying on credit from the same agent. High profits were obtained by agents (Lewis *et. al.*, 1996)

Shrimps are considered to be among the most perishable of food stuffs. Fresh shrimps are very susceptible to spoilage and as a consequence may be expected to undergo some degree of deterioration between catching and delivery to the receiving room of the processing plant. Temperature affects the rate at which bacteria multiply (Ronsivalli and Charm, 1975). The most important means of preserving fresh shrimp is by chilling to about 0-4°C. The most common chilling media are wet ice, mixture of ice and seawater or refrigerated seawater (Sikorski *et. al.*, 1994).

The freshness of quality of a particular food refers to the degree of excellence (Botta, 1995). The degree of excellence referred all sensory/organoleptic variables (appearance, texture, odor and flavor). Freshness quality is considered to be an extremely important factor in determining overall quality (Howgate, 1982). The location of harvest (Huss, 1988; Love 1988), time of the year (Love, 1975), method of catching (Botta *et. al.*, 1987; Huss 1988) and the manner in which seafood handled (Botta *et. al.*, 1986, 1989) seriously affect the degree of excellence.

Freshness of seafood has a considerable influence on its quality and is the most important criteria for judging the quality (Botta, 1994).

Sensory/organoleptic evaluation is the most satisfactory and acceptable method to access the quality of fish and shellfish (Connell, 1976; Larmond, 1976; Howgate, 1982).

Detailed bacteriological evaluation of shrimp from cold waters have been attempted by Harrison and Lee (1969); Cann *et. al.* (1971); Novak (1973) and Lee and Pfeifer (1977). Such data regarding tropical shrimp is rather scanty (Cann, 1977; Zuberi *et. al.*, 1983). The shelf life of shrimp in ice has been studied by many workers (Surendran *et. al.*, 1985; Surendran and Gopakumar, 1981; Wu and Chen, 1980; Reilly *et. al.* 1986).

3.0 MATERIALS AND METHODS

The study area included three districts of Khulna region, a well known shrimp production zone situated in the southwestern part of Bangladesh. The three districts were namely Bagerhat, Khulna and Satkhira as shown in Fig. 1

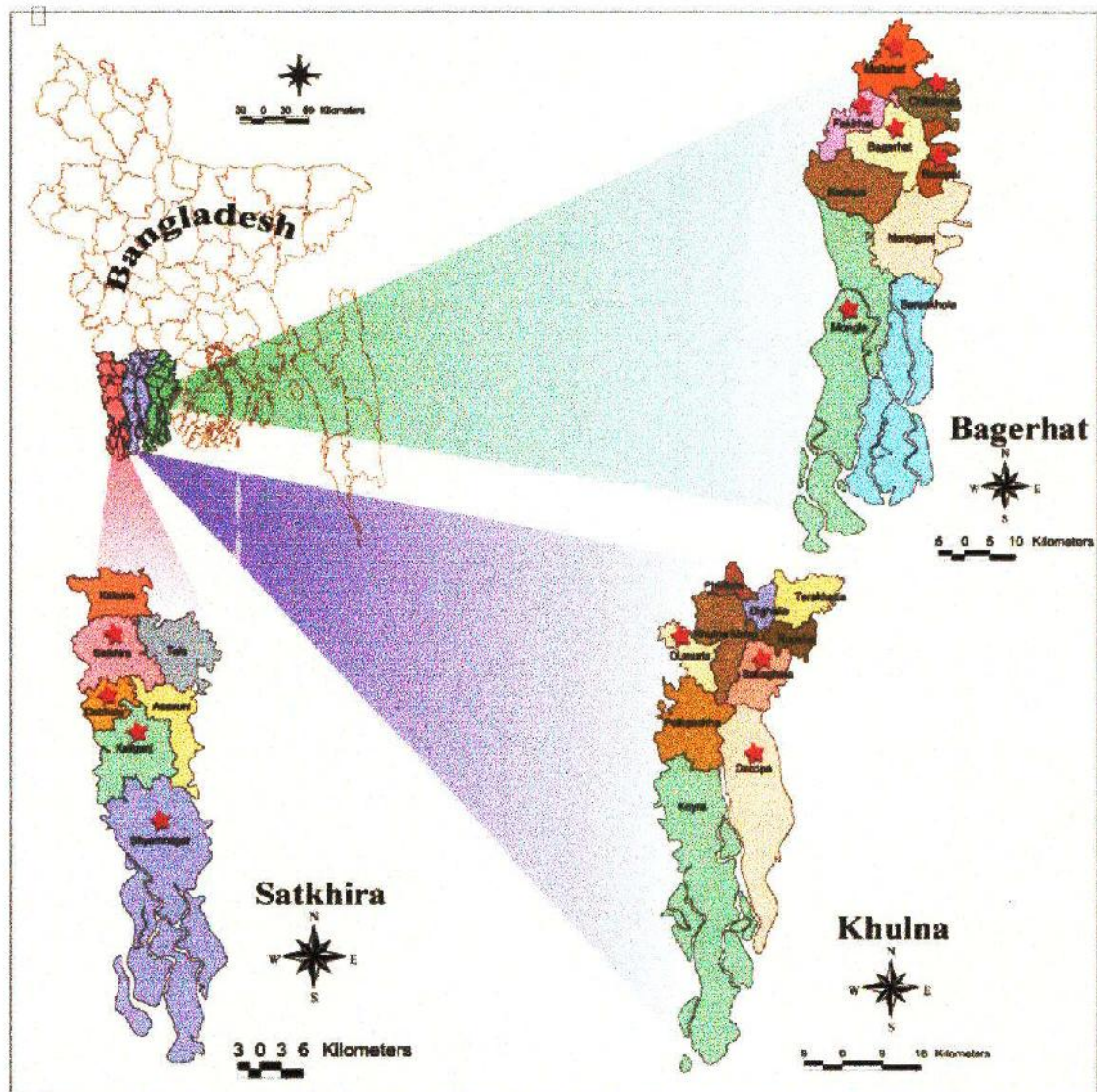


Figure 1: Map of surveyed areas showing the three districts and upazillas (marked)

Each surveyed areas in Bagerhat district included 6 upazillas, 15 bazaars, 89 ghers, 42 farias and 138 depots. In Khulna district, surveyed areas included 3 upazillas, 7 bazaars, 34 ghers, 11 farias and 45 depots. In Satkhira district, 4 upazillas, 7 bazaars, 29 ghers, 33 farias and 27 depots were surveyed. The total number of upazillas were 13, 29 bazaars, 152 ghers, 86 farias and 210 depots respectively.

The study was also conducted on 22 agents of Natun Bazar Launch Ghat and 8 processing plants situated adjacent to Rusha river in Khulna. (Table 2).

Table 2: Surveyed areas including districts, upazillas, location no. of ghers, farias, depots, agents and processing plants

District	Upazilla	Location	No. of Ghers	No. of Faria	No. of Depots
Bagerhat	Fakirhat	Mulghor Bazar	12	07	14
		Faltita Battala Bazar	12	10	12
		Mansa Bazar	06	02	08
	Rampal	Foila Bazar	10	05	16
		Gona Bridge Bazar	02	02	06
		Babubari Bazar	02		05
	Mongla	Digras Bazar	03		04
		Mollarhat Bazar	06	02	06
	Mollarhat	Baroghat Bazar	04	03	15
		Katakhal Bazar	04	02	05
	Bagerhat	Baripara Bazar	06	02	15
		Chintirkhol Bazar	03		04
		Haderhat	04		05
	Chitalmari	Chitalmari Bazar (Sadar)	07	04	11
		Chitalmari Bazar (Charbaniani)	08	03	12
Total (Bagerhat)	06	15	89	42	138
Khulna	Dakop	Batbunia Bazar	05	02	07
		Chalna Bazar	04	02	07
	Batiaghata	Batiaghata Bazar	03	-	03
		Gallamari Bazar	-	-	03 ✓
	Dumuria	Dumuria Bazar	05	02	07
		Tipna Bazar	07	03	07
		Kharnia Bazar	10	02	11
Total (Khulna)	03	07	34	11	45
Satkhira	Satkhira	Benerpota Bazar	03	09	03
		Sutanpur Bazar	06	03	04
	Debhata	Baliadanga Bazar	02	02	02
		Parulia Bazar	03	03	03
	Kaliganj	Kaliganj Bazar	02	05	05
	Shyamnagar	Bangshipur Bazar	08	06	06
		Munshiganj Bazar	05	05	04
Total (Satkhira)	04	07	29	33	27
Grand Total	13	29	152	86	210
22 Shrimp Agents					
8 Processing Plants					

Initially, a reconnaissance survey was conducted in the studied area. During this period, informal discussions were held with the relevant people in the shrimp distribution channel. Through the reconnaissance survey and informal discussion, a model questionnaire was designed. The questionnaire was rearranged for the purpose of inclusion of relevant information, consistency in the design of the questionnaire and pre-testing before finalizing the questionnaire form (Appendix I-V) through indicators used for different stakeholders as shown below.

• Indicators for Gher ⇒ Source of fund ⇒ Transportation ○ Materials ○ Carriers ○ Routes ⇒ Manpower ⇒ Salary ⇒ Education ⇒ Religion ⇒ Handling Period	• Indicators for Faria ⇒ Source of fund ⇒ Icing system ⇒ Transportation ○ Materials ○ Carriers ○ Routes ⇒ Education ⇒ Religion ⇒ Sources of washing water ⇒ Handling Period	
• Indicators for Depot ⇒ Physical structure ⇒ Ownership ⇒ Icing system ⇒ Sources of fund ⇒ Transportation ○ Materials ○ Carriers ○ Routes ⇒ Manpower ⇒ Salary ⇒ Education ⇒ Religion ⇒ Handling Period	• Indicators for Agent ⇒ Physical structure ⇒ Ownership ⇒ Production ⇒ Sources of fund ⇒ Icing system ⇒ Transportation ○ Materials ○ Carriers ○ Routes ⇒ Manpower ⇒ Salary ⇒ Education ⇒ Religion ⇒ Handling Period	• Indicators for Processing Plant (Receiving Section) ⇒ Icing system ⇒ Quality assurance ⇒ Handling Period

Organoleptic score sheet was developed for shrimp from the score sheet reported by Shewan and Ehenberg (1977) (Appendix-VI) for fin fish. From the developed organoleptic score sheet, an overall acceptability ranking was done (Appendix-VII). Shrimp were taken out from each point of the marketing channel and were evaluated with the developed score sheet.

Data obtained were grouped, categorized and interpreted according to the objectives as well as the indicators and presented in graphs and tabular forms.

4.1.1 Stake holders in the shrimp marketing channel

4.1.1.1 Gher

4.1.1.1.1 Manpower, Salary and Source of fund

Manpower, salary and source of fund for gher in Bagerhat district is shown in Table 3. Total number of gher surveyed were 89. Mulghar bazar, Faltita Battala bazar, Foila bazar and Chitalmari bazar indicated higher number of male workers. While Gona Bridge bazar showed as many as 14 female workers. The salary of both male and female ranged between 60-120 Tk./day. The salary for male were relatively higher (90-120 Tk./day) but the highest for female ranged between 70-100 Tk./day. Most of the gher were self financed.

Table 3: Manpower, salary and source of fund for gher in Bagerhat District.

Surveyed area	Sample Size	No. of Owners	No. of Manpower		Salary (Tk/day)		Source of Fund	
			Male	Female	Male	Female	Self	Loan
Mulghor Bazar	12	16	35	7	85-120	60-100	10	2
Faltita Battala Bazar	12	18	27	8	90-120	65-90	8	4
Mansa Bazar	06	8	15	7	80-100	60-90	6	
Foila Bazar	10	16	26	14	90-120	70-100	6	4
Gona Bridge Bazar	02	3	3	-	80-100	60-90	1	1
Babubari Bazar	02	2	4	-	70-90	60-90	2	
Digraz Bazar	03	4	7	-	70-100	60-90	2	1
Mollarhat Bazar	06	7	14	7	80-110	65-100	5	1
Baroghat Bazar	04	7	11	6	85-110	60-90	4	-
Katakhali Bazar	04	6	9	5	90-120	60-100	4	-
Baripara Bazar	06	9	17	8	80-120	70-100	5	1
Chintirkhol Bazar	03	3	6	-	60-90	50-80	3	-
Haderhat	04	6	11	-	60-90	50-90	4	-
Chitalmari Bazar (Sadar)	07	9	15	8	80-110	70-100	5	2
Chitalmari Bazar (Charbaniari)	08	12	20	8	80-120	65-100	7	1

Number of people (male) working in most of the gher in Khulna varied between 7 and 14 while only in Batbunia bazar 2 female were observed to work. The salary for male ranged between 80-120 Tk./day and for female 65-90 Tk./day respectively. Most gher were self-financed and all but one did not take loan. (Table 4)

Table 4: Manpower, salary and source of fund for gher in Khulna District

Surveyed area	Sample Size	No. of Owners	No. of Manpower		Salary (Tk/day)		Source of Fund	
			Male	Female	Male	Female	Self	Loan
Batbunia Bazar	05	7	12	2	85-120	65-90	4	1
Chalna Bazar	04	6	10	-	80-110	-	3	2
Batiaghata Bazar	03	4	7	-	80-110	-	3	
Dumuria Bazar	05	8	14	-	85-120	-	4	1
Tipna Bazar	07	8	19	-	70-100	-	4	3
Kharnia Bazar	10	15	31	-	80-110	-	8	2

Table 5 shows manpower, salary and source of fund for gher situated in Satkhira district. Bangshipur bazar and Sultanpur bazar indicated high number of manpower (31 and 21). Female workers were very low. Salary varied between different ranges highest being 60-80 Tk./day for male and 40-70 Tk./day for female. Sources of fund indicated a similar pattern to that observed for Khulna and Bagerhat district.

Table 5: Manpower, salary and source of fund for gher in Satkhira District

Surveyed area	Sample Size	No. of Owners	No. of Manpower		Salary (Tk/day)		Source of Fund	
			Male	Female	Male	Female	Self	Loan
Benerpota Bazar	03	2	2	1	60-80	40-70	2	1
Sutanpur Bazar	06	5	21	-	50-70	-	4	2
Baliadanga Bazar	02	2	2	-	33-50	-	1	1
Parulia Bazar	03	3	9	2	40-60	30-50	2	1
Kaliganj Bazar	02	2	13	-	30-60	-	1	1
Bangshipur Bazar	08	6	31	-	50-80	-	7	1
Munshiganj Bazar	05	3	8	1	50-70	35-50	3	2

4.1.1.1.2 Transportation (From gher to depot bypassing faria)

4.1.1.1.2.1 Material

The materials used for transportation of shrimp were bamboo baskets, plastic materials, aluminum/steel pots and bags. In Bagerhat district, the study indicated the use of aluminum pot mostly (Fig. 3a). Other materials were used to a lesser extent. Similar pattern of results were observed in Khulna district (Fig. 3b). Bamboo baskets were normally used in Satkhira district but in Kaliganj bazar, plastic materials were used mostly for transportation of shrimp from gher to depot. Also, Parulia bazar showed the use of plastic materials to some extent (Fig. 3c).

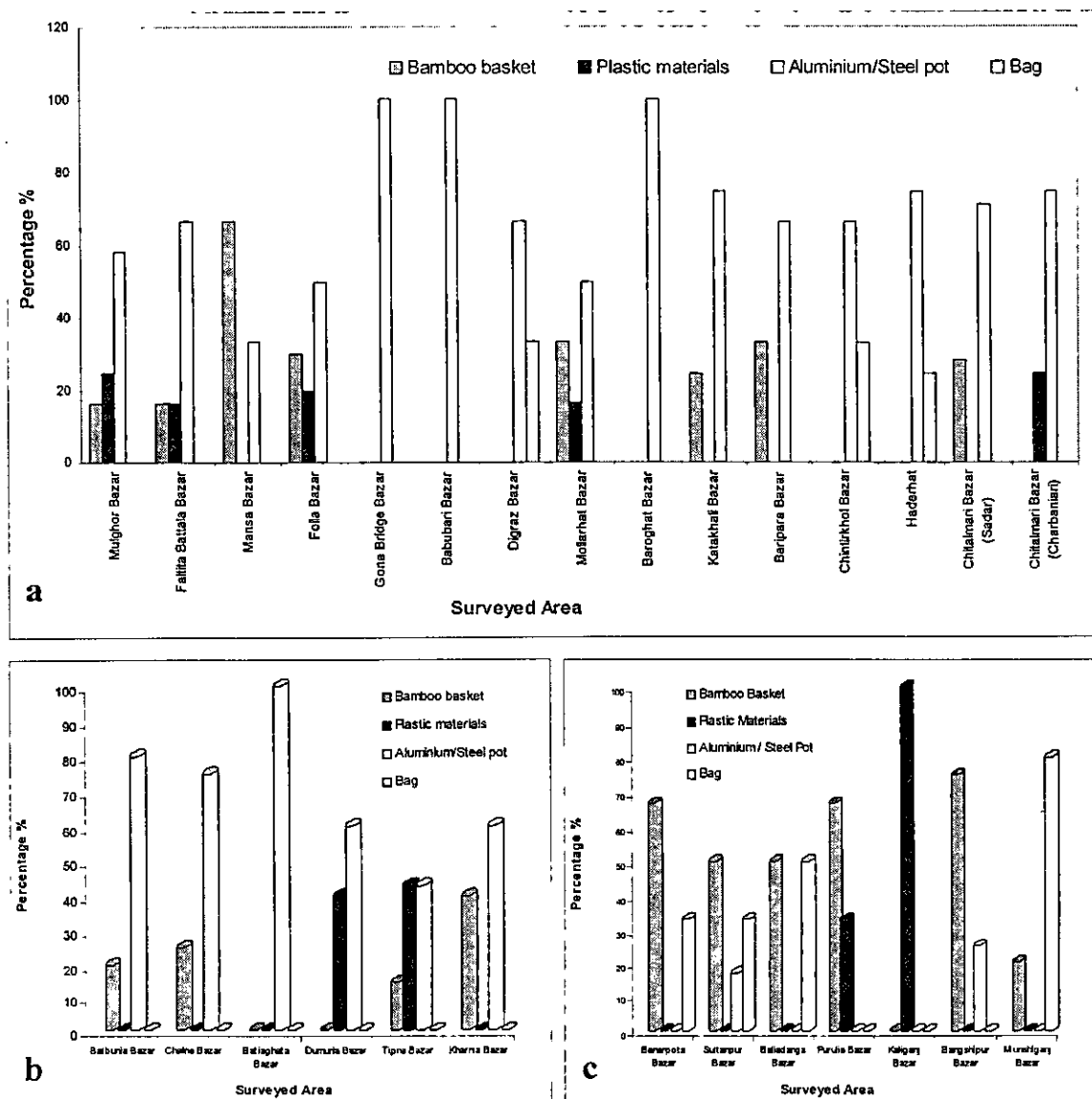


Figure 3: Transportation Materials (Gher to Depot) (a) Bagerhat (b) Khulna (c) Satkhira

4.1.1.1.2.2 Route

Shrimps were distributed in the three districts through earthen pathways, canals, rivers and roads (brick/pitch). In case of Bagerhat district, earthen pathways were mostly used (Fig. 4a). While in Khulna district, both earthen pathways and roads (brick/pitch) were observed (Fig. 4b). Similar results were found for Satkhira district (Fig. 4c).

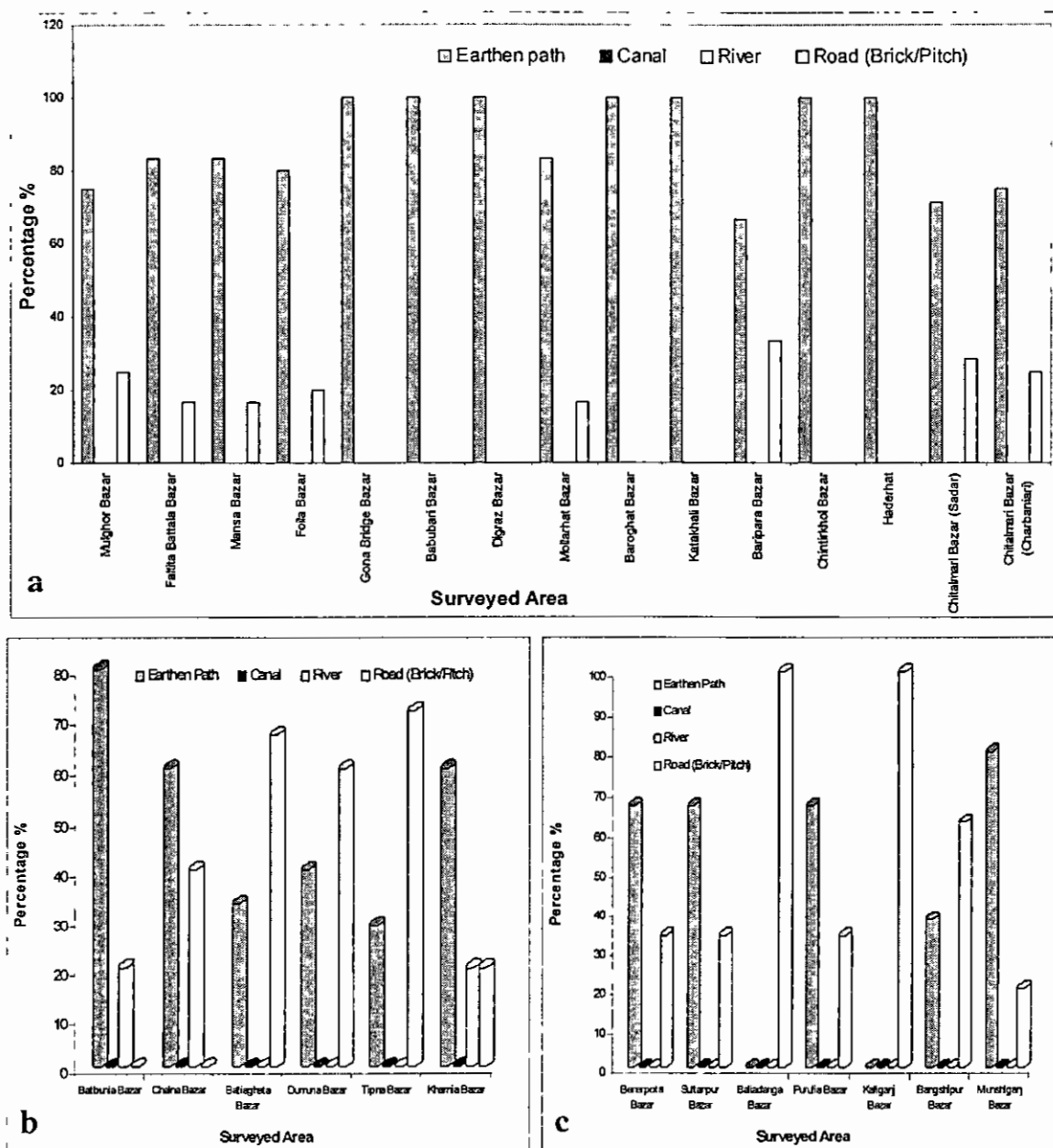


Figure 4: Transportation Route (Gher to Depot) (a) Bagerhat (b) Khulna (c) Satkhira

4.1.1.1.2.3 Carrier

Usually three types of carrier were used for distributing shrimp from gher to depot. i.e. van, hand/head, bi-cycle. In Bagerhat district, shrimps were mostly distributed by van and hand/head (Fig. 5a). While in Khulna district, enormous quantities of shrimps were distributed by hand/head from gher to depot (Fig. 5b). The scenario was a little different observed in Satkhira district. Here both van and hand/head were used as career (Fig. 5c).

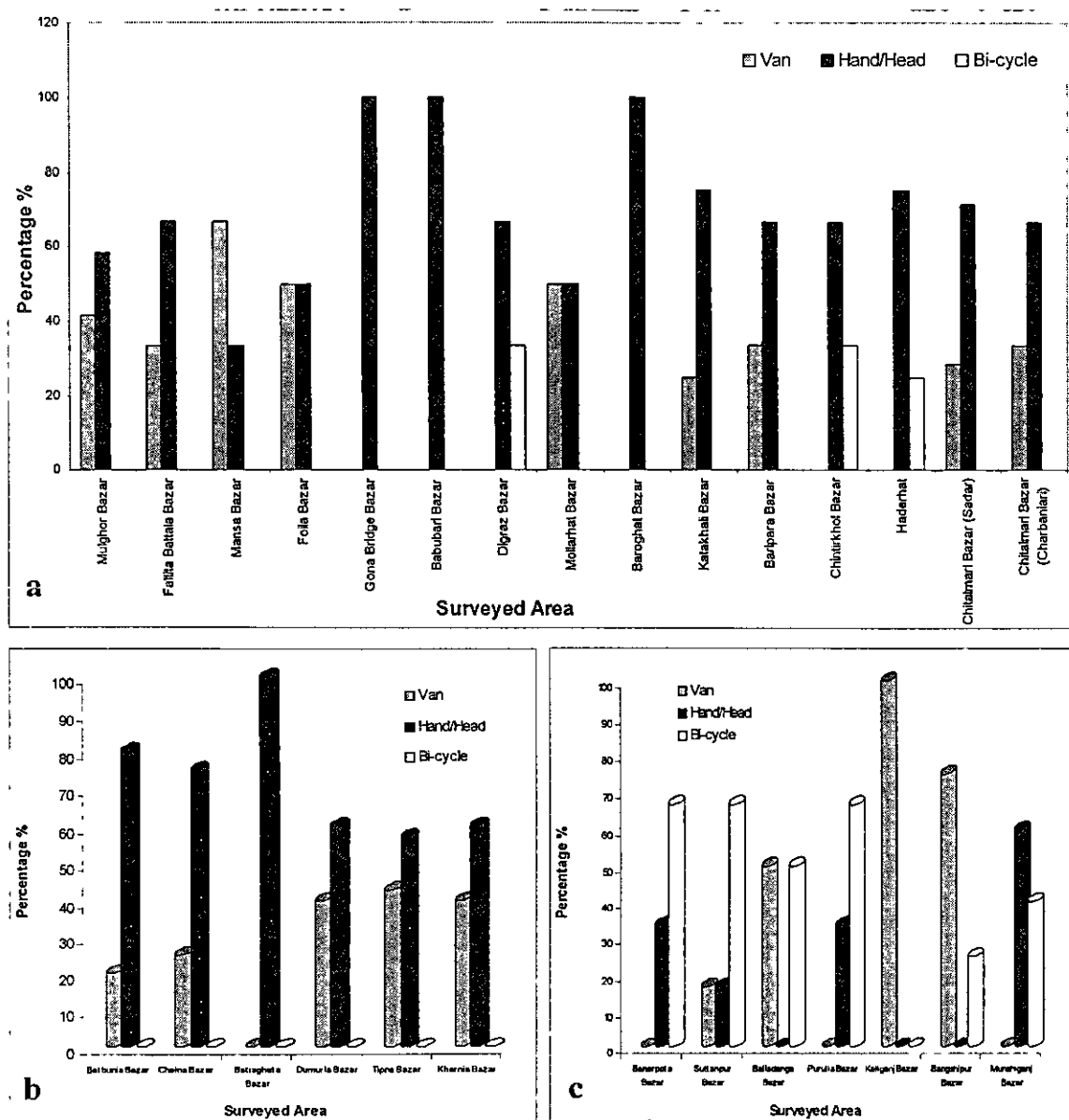


Figure 5: Transportation Carrier (Gher to Depot) (a) Bagerhat (b) Khulna (c) Satkhira

4.1.1.1.3 Education

In all the three districts, the workers in gher were either illiterate or had primary and secondary education. Only a few had university education (Fig. 6a, 6b, 6c).

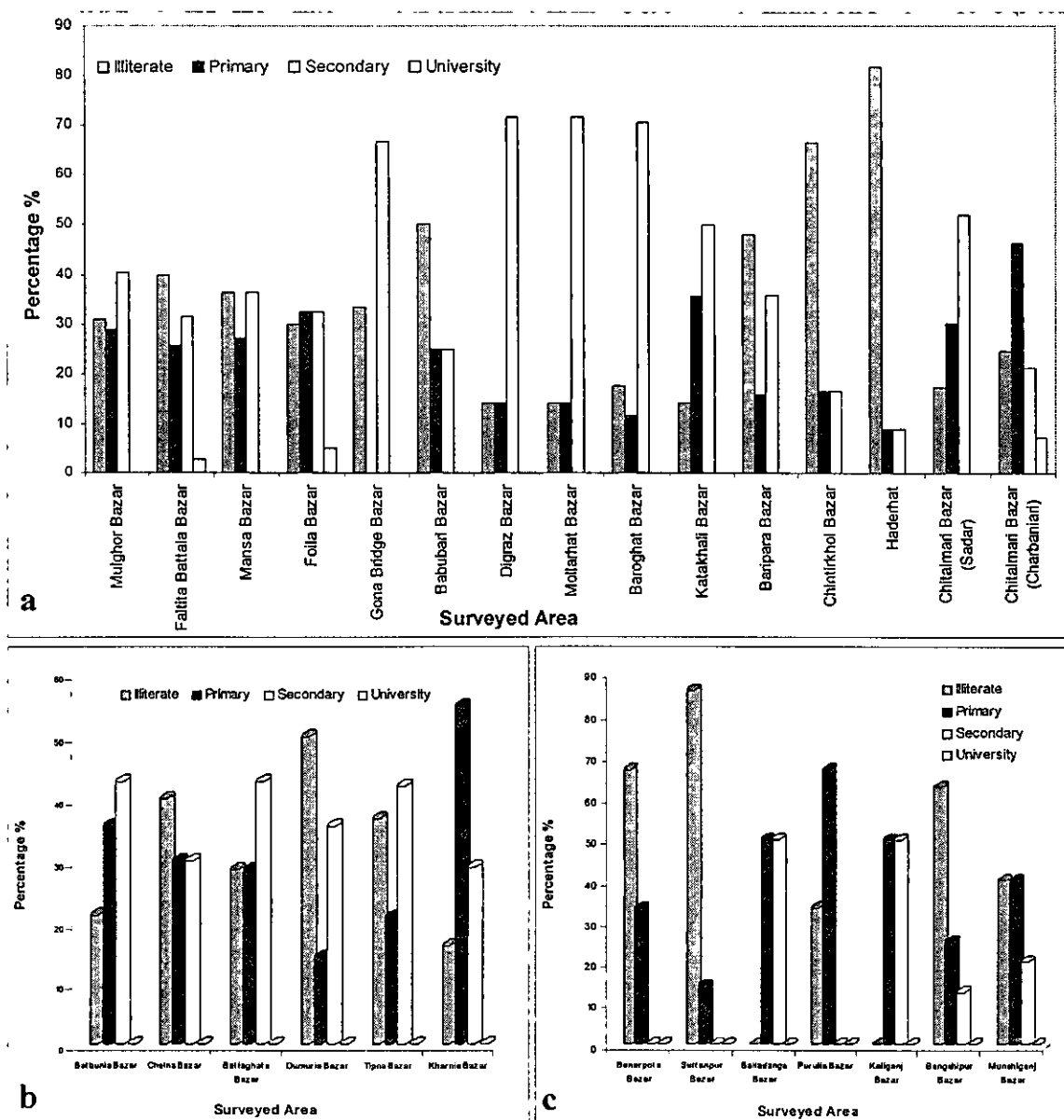


Figure 6: Education status of workers in gher (a) Bagerhat (b) Khulna (c) Satkhira

4.1.1.1.4 Religion

Workers in gher of Bagerhat districts were both Muslims and Hindus though, Hindus outnumbered Muslims (Fig. 7a). Similar, results were observed in Khulna district (Fig. 7b). But in Satkhira district Muslims were higher in number comparing the Hindus working in the gher (Fig. 7c).

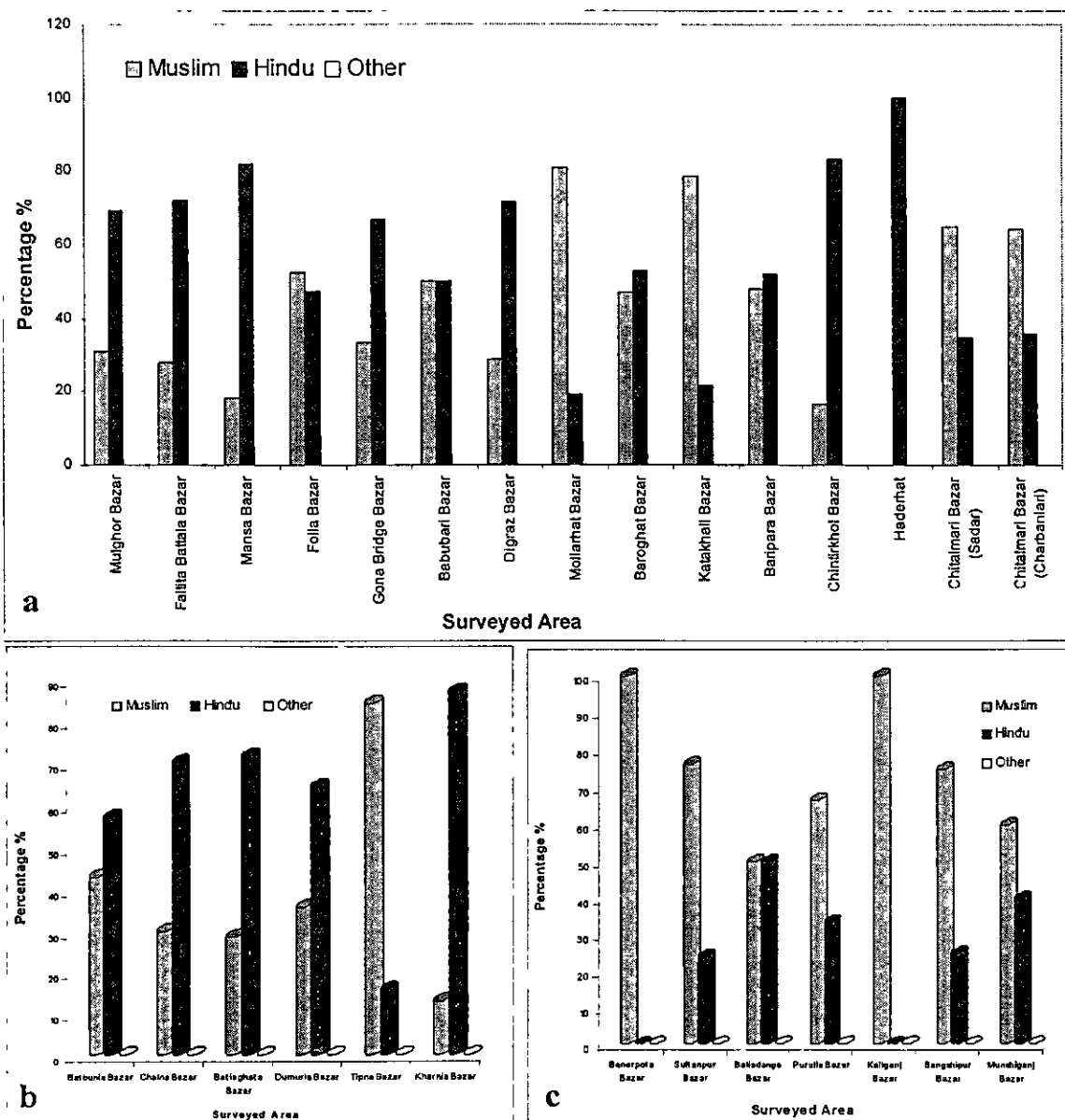


Figure 7: Religious status of workers in gher (a) Bagerhat (b) Khulna (c) Satkhira

4.1.1.2 Faria

4.1.1.2.1 Transportation

4.1.1.2.1.1 Material

In Bagerhat district, aluminum pots were mainly used for transportation of shrimp. In Khulna district, a mixture of aluminum pots and plastic baskets were used. However in Satkhira district, bamboo baskets, aluminum pots and plastic baskets were used randomly (Fig. 8).

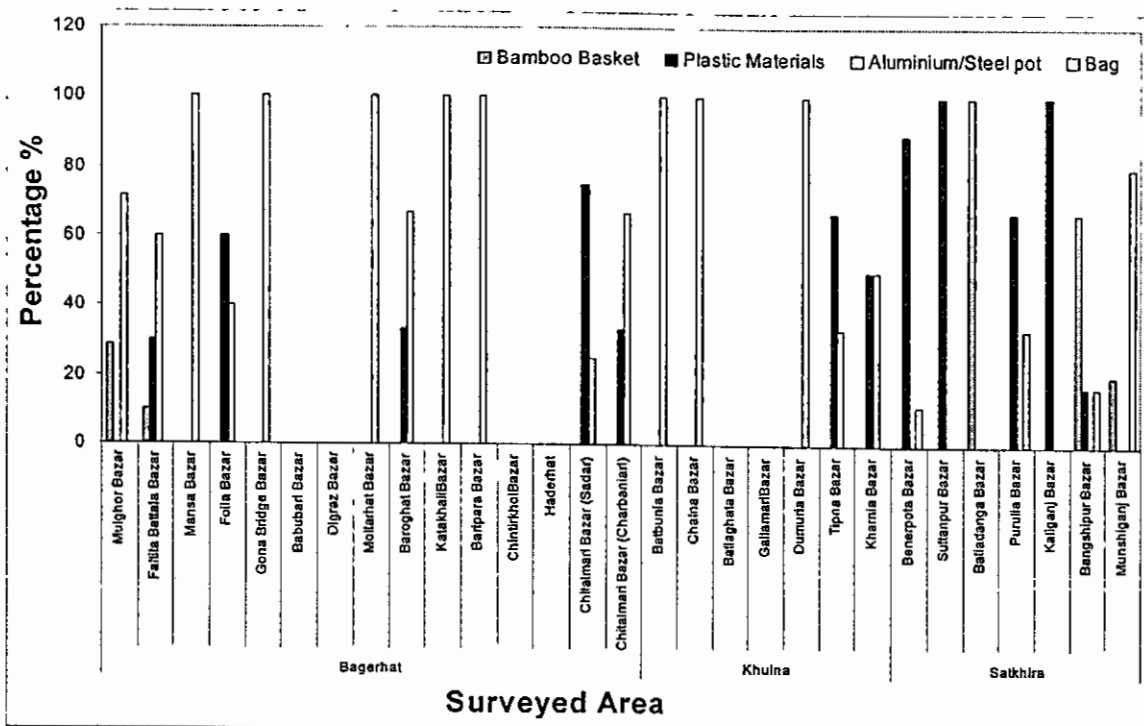


Figure 8: Transportation materials used by farias in different districts

4.1.1.2.1.2 Carrier

As illustrated in Fig. 9, farias mainly used vans for transportation. Only in some places, shrimps were transported by bi-cycles particularly in Satkhira district e.g. Baliadanga bazar and Parulia bazar.

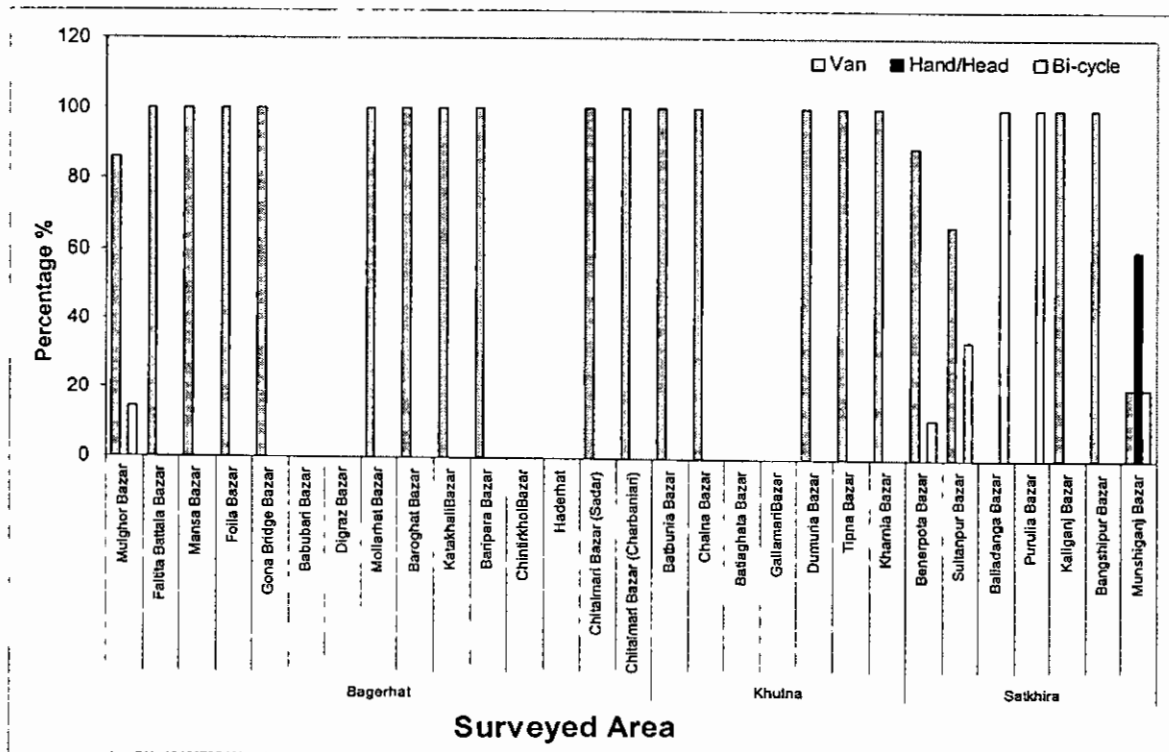


Figure 9: Transportation carrier used by farias in different districts

4.1.1.2.1.3 Route

The routes for transportation of shrimp by faria are shown in Fig. 10. Both earthen pathways and roads were the transportation routes. In Khulna district, mainly earthen pathways were used. While in Satkhira district both earthen pathway and road (brick/pitch) were means of transportation. Only in Bangshipur bazar, canals were used for transportation (Fig. 10).

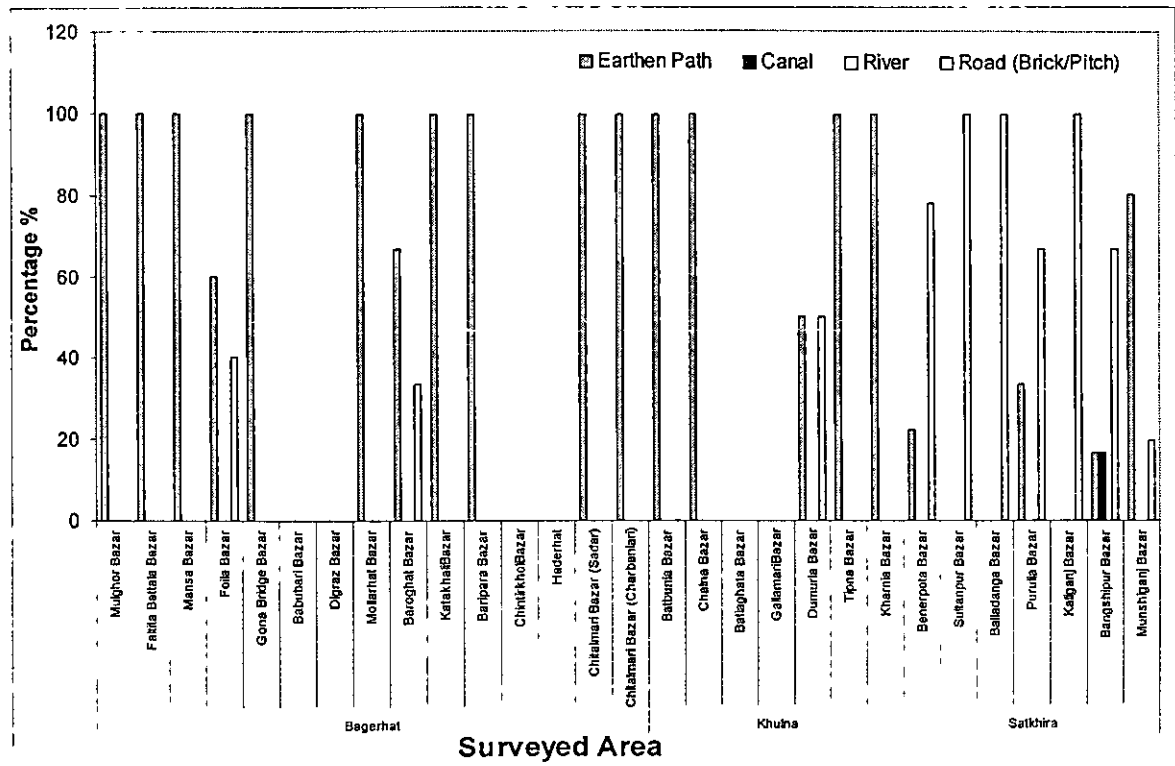


Figure 10: Transportation routes used by faria in different districts

7.1.1.2.2 Icing ratio (ice : shrimp)

Fig. 11 shows the ratio of shrimp to ice used by faria in the three different districts. These ratios varied widely (0.5:1, 1:1, 1.5:1, and 2.0:1) in most of the places in Bagerhat and Khulna district e.g. 0.5:1 and 1:1 of ice and shrimp. While in Satkhira district, 2.0:1 and 1.5:1 ratio of ice and shrimp were used. No clear evidence of particular ratio of ice and shrimp used was observed at any places in the three districts.

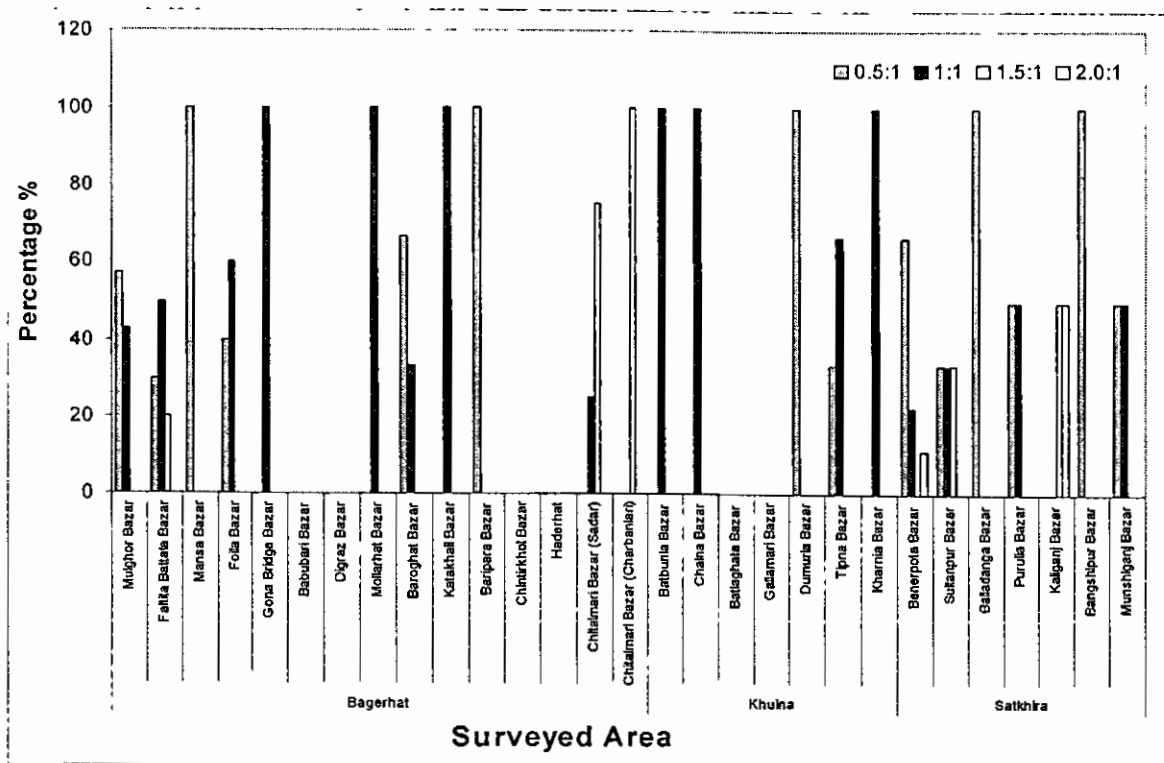


Figure 11: Icing ratio (ice:shrimp) used by faris in different districts

4.1.1.2.3 Icing Spot

Farias chose different spots for using ice. Different spots were home, gher, depots and even use of no ice at all. Most of the faris in the three district used ice when shrimps were bought to depots (Fig. 12)

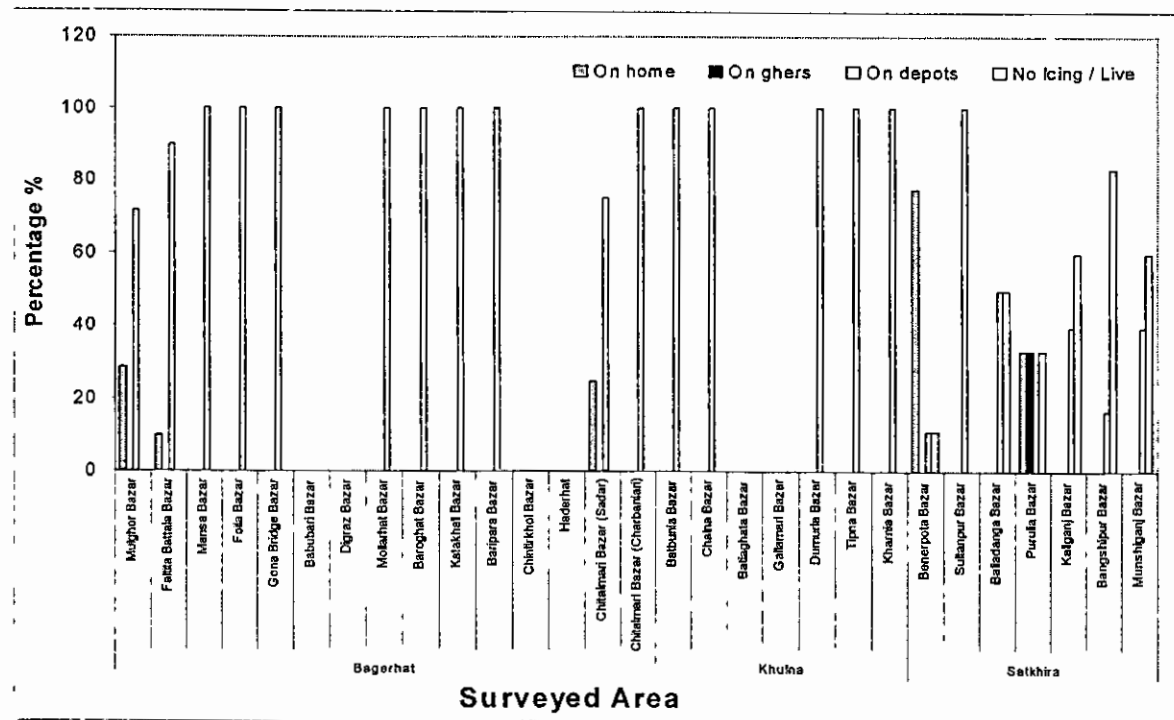


Figure 12: Icing spot used by faris in different districts

4.1.1.2.4 Sources of washing water

Water used for washing shrimp was from gher, ponds, rivers, canals, shallow and deep tubewells. Many places were observed to use shallow tubewells for washing. Also in some places water from river/gher was used (Fig. 13).

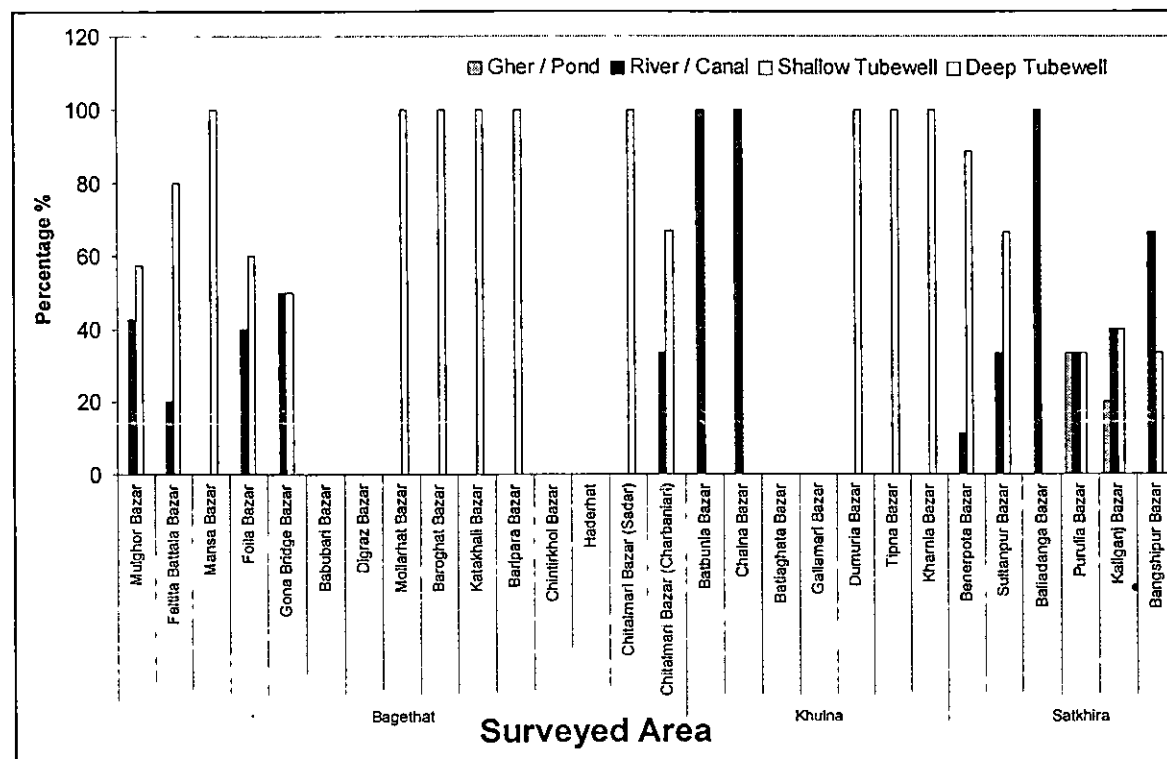


Figure 13: Sources of washing water used by faris in different districts

4.1.1.2.5 Education

Faris were mostly illiterate with a few having primary and secondary education (Fig. 14).

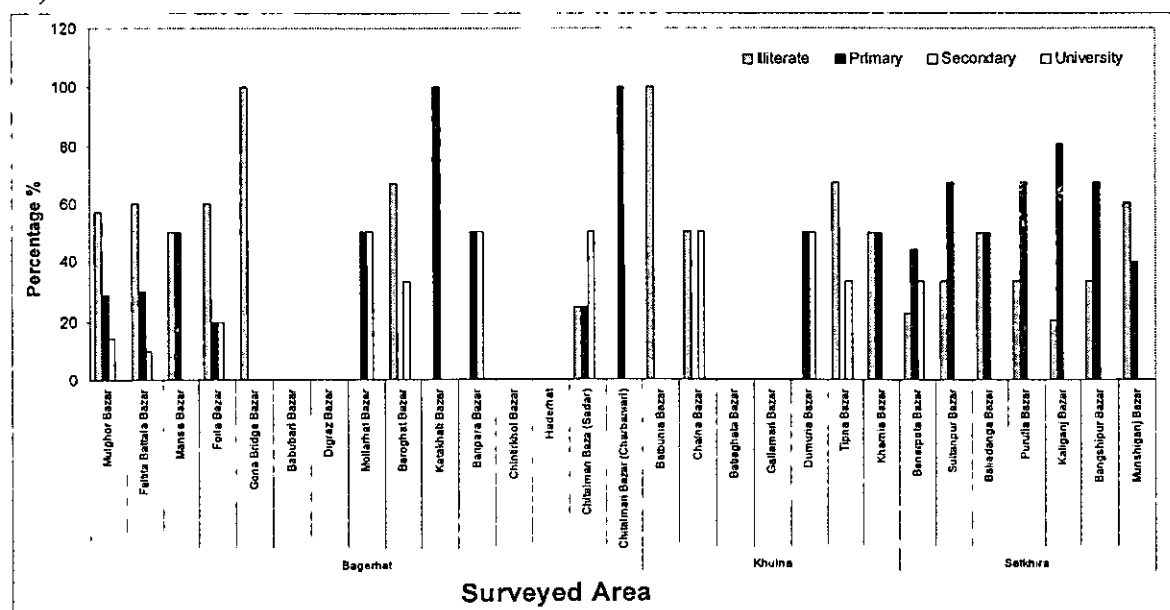


Figure 14: Education status of faris in different districts

4.1.1.2.6 Religion

Religion of the farias included both Muslims and Hindus but varied from place to place within a district and between districts themselves (Fig. 15). Mostly Muslims were found in three of the districts engaged in this kind of work.

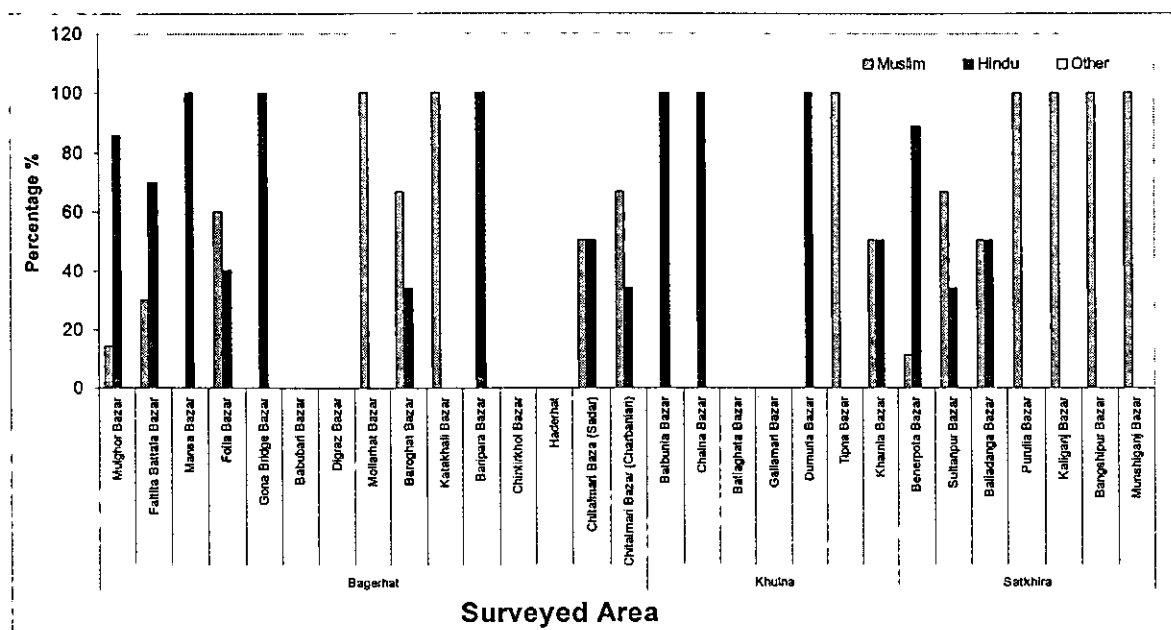


Figure 15: Religious status of farias in different districts

4.1.1.3 Depot

4.1.1.3.1 Salary

Salary of the workers in depots situated in Bagerhat, Khulna and Satkhira districts are shown in Table 6, 7 and 8, salary varied between different posts i.e. manager/ accountant, graders and children. In Bagerhat district, salary of manager/accountant ranged between 2,500-4,000 Tk./month, highest being observed in Foila bazar (3,500-4,000 Tk./month). Salary of graders varied between 1,500-2,500 Tk./month, highest in Baroghat Bazar (2,200-2,500 Tk./month). While highest salary was observed in Mollarhat bazar for children (800-1,000 Tk./month), usual salary ranged from 500-1,000 Tk./month (Table 6). Almost similar pattern of salary ranges were observed for workers in depots of Khulna district (Table 7) and Satkhira district (Table 8).

Table 6: Salary range of workers in depots (Bagerhat)

Surveyed area	Sample size	Salary (Tk/month)		
		Manager/ Accountant	Graders	Children
Mulghor Bazar	14	3,000-3,500	2,000-2,200	500-800
Faltita Battala Bazar	12	3,000-3,200	1,800-2,000	500-700
Mansa Bazar	08	3,000-3,500	2,000-2,500	500-800
Foila Bazar	16	3,500-4,000	2,000-2,500	500-1,000
Gona Bridge Bazar	06	3,000-3,200	1,800-2,000	-
Babubari Bazar	05	2,800-3,000	1,500-1,800	-
Digraz Bazar	04	3,000-3,200	1,800-2,000	500-800
Mollarhat Bazar	06	3,000-3,500	2,000-2,500	800-1000
Baroghat Bazar	15	3,200-3,500	2,200-2,500	500-700
Katakhali Bazar	05	2,800-3,000	1,800-2,000	-
Baripara Bazar	15	2,500-3,000	2,000-2,200	500-700
Chintirkhol Bazar	04	-	1,500-1,800	400-500
Haderhat	05	-	1,800-2,000	300-500
Chitalmari Bazar (Sadar)	11	3,000-3,500	2,000-2,500	600-800
Chitalmari Bazar (Charbanianari)	12	3,000-3,500	2,000-2,500	600-700

Table 7: Salary range of workers in depots (Khulna)

Surveyed area	Sample size	Salary (Tk/month)		
		Manager/ Accountant	Graders	Children
Batbunia Bazar	07	2,500-3,000	2,000-2,200	500-700
Chalna Bazar	07	3,000-3,200	2,200-2,500	500-800
Batiaghata Bazar	03	-	1,800-2,000	-
Gallamari Bazar	03	3,000-3,500	2,000-2,500	500-800
Dumuria Bazar	07	2,500-3,000	1,800-2,000	500-700
Tipna Bazar	07	3,000-4,000	2,000-2,500	500-1000
Kharnia Bazar	11	2,800-3,200	1,800-2,000	500-700

Table 8: Salary range of workers in depots (Satkhira)

Surveyed area	Sample size	Salary (Tk/month)		
		Manager/ Accountant	Graders	Children
Benerpota Bazar	03	1,200-1,500	800-1,000	-
Sutanpur Bazar	04	1,500-6,000	1,000-4,000	-
Baliadanga Bazar	02	-	800-1,500	-
Parulia Bazar	03	1,500-5,000	1,500-3,200	-
Kaliganj Bazar	05	1,200-4,000	800-2,000	-
Bangshipur Bazar	06	1,200-2,500	1,200-1,600	-
Munshiganj Bazar	04	1,200-3,000	1,200-2,000	-

4.1.1.3.2 Area of depot

Area of depots in the three districts is shown in Fig.16. In Bagerhat district, most of the depots fell in the range of 150-200 sq. ft. and 200-250 sq. ft. Only at four places i.e.

Mansa Bazar, Baroghat Bazar, Chitalmari Bazar (Sadar) and Chitalmari Bazar (Charbanari), depots were found to be bigger than 300 sq. ft. The smallest depot was in Foila Bazar with an area of 25-50 sq. ft. In Khulna District, a good number of depots were bigger than 300 sq. ft. Smallest size depots ranged from 50-100 sq. ft. in Khulna District. Many of the depots in Satkhira were in the range of 25-50 sq. ft. and 100-150 sq. ft. However, all sizes of depots were observed in Satkhira district.

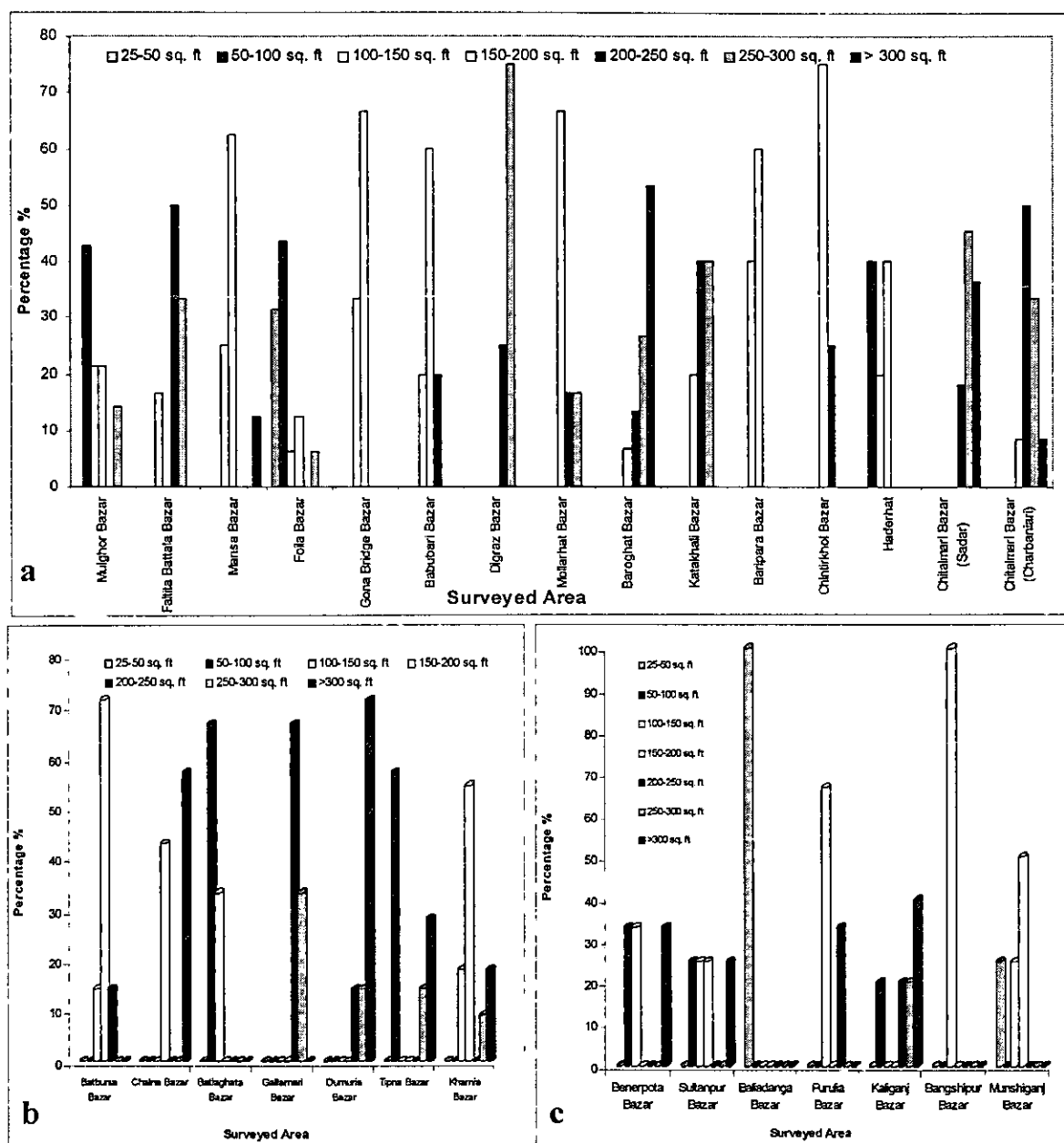


Figure 16: Area of depots (a) Bagerhat (b) Khulna (c) Satkhira

4.1.1.3.3 Physical Structure

Results of the physical structure of depots of the three districts are shown in Fig.17. Physical structure was considered in relation to floor, wall and roof. In Bagerhat and Khulna districts, most of the depots had plaster floor while Satkhira had mosaic floor.

Wall in all the three district were mostly made of bricks. While roof in the three districts were made of tin shed in most of the depots.

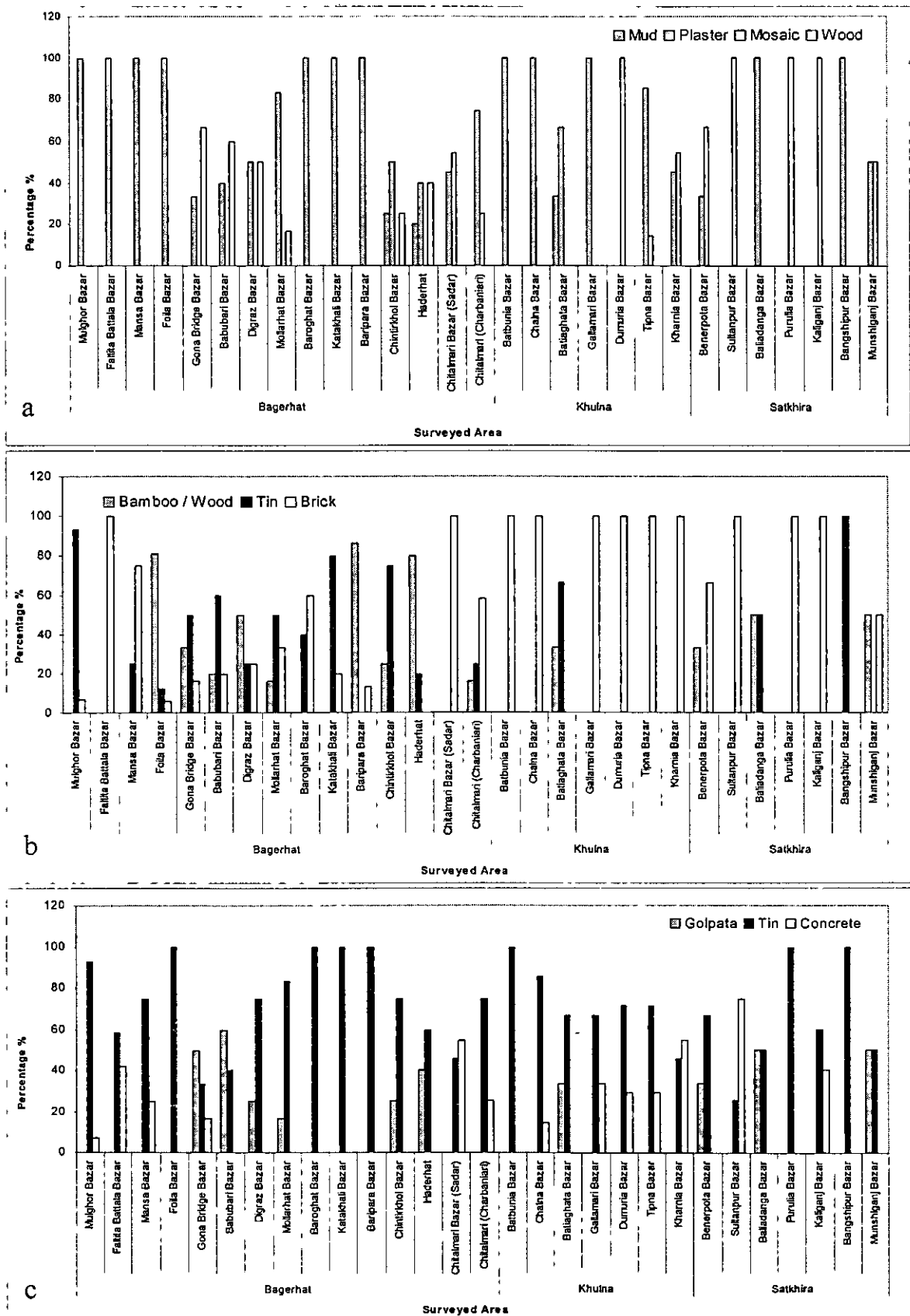


Figure 17: Physical structure of depots (a) Floor (b) Wall (c) Roof

4.1.1.3.4 Transportation

4.1.1.3.4.1 Material

Materials used for transportation of shrimp from depot in Bagerhat district were mainly bamboo basket with polythene sheet. Also quite a few numbers of materials were plastic drums. Only at Faltila Battala Bazar, plastic materials were used for transportation (Fig. 18a). In Khulna district, transportation of shrimp from depot to agents were mainly by plastic drum. At two places in Khulna district i.e. Batbunia Bazar and Charna Bazar, plastic materials were used for shrimp transportation. Only at Batiaghata Bazar, bamboo baskets were used mainly. While in Satkhira district, bamboo baskets were used in most of the bazars. A few bazars were observed to use plastic drum also (Fig. 18c).

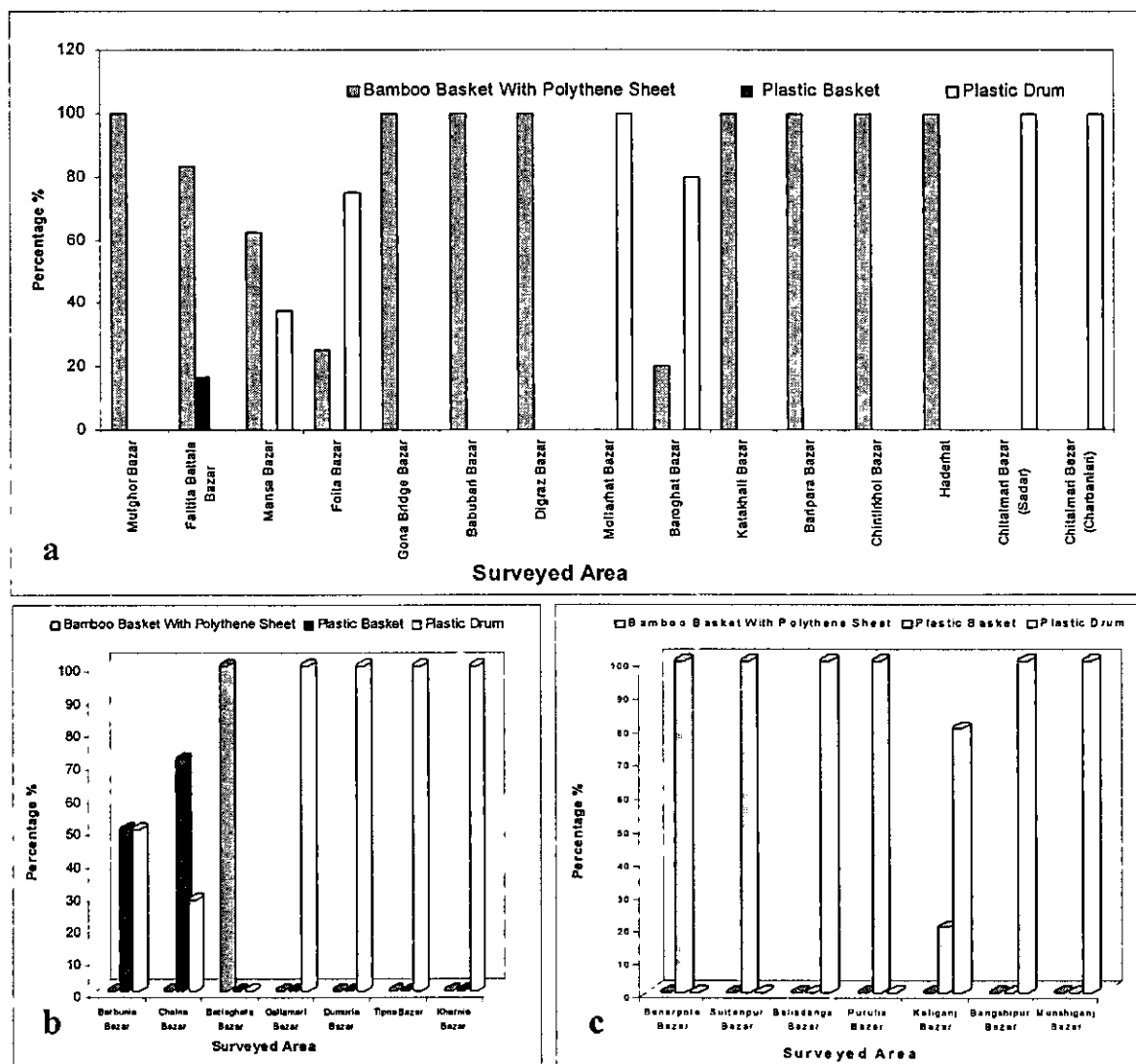


Figure 18: Transportation materials used in depots (a) Bagerhat (b) Khulna (c) Satkhira

4.1.1.3.4.2 Carrier

In most places in Bagerhat district, pickup vans were used for transportation. Only at two places cycle vans were found for transportation. At Foila Bazar, in addition to pickup van, Bus/truck was also used for transportation. In Khulna district, mostly pickup vans were used. Bus/Truck was found at Batiaghata Bazar. In Satkhira district, mostly pickup vans had been used for transportation of shrimp from depot to agent (Fig. 19).

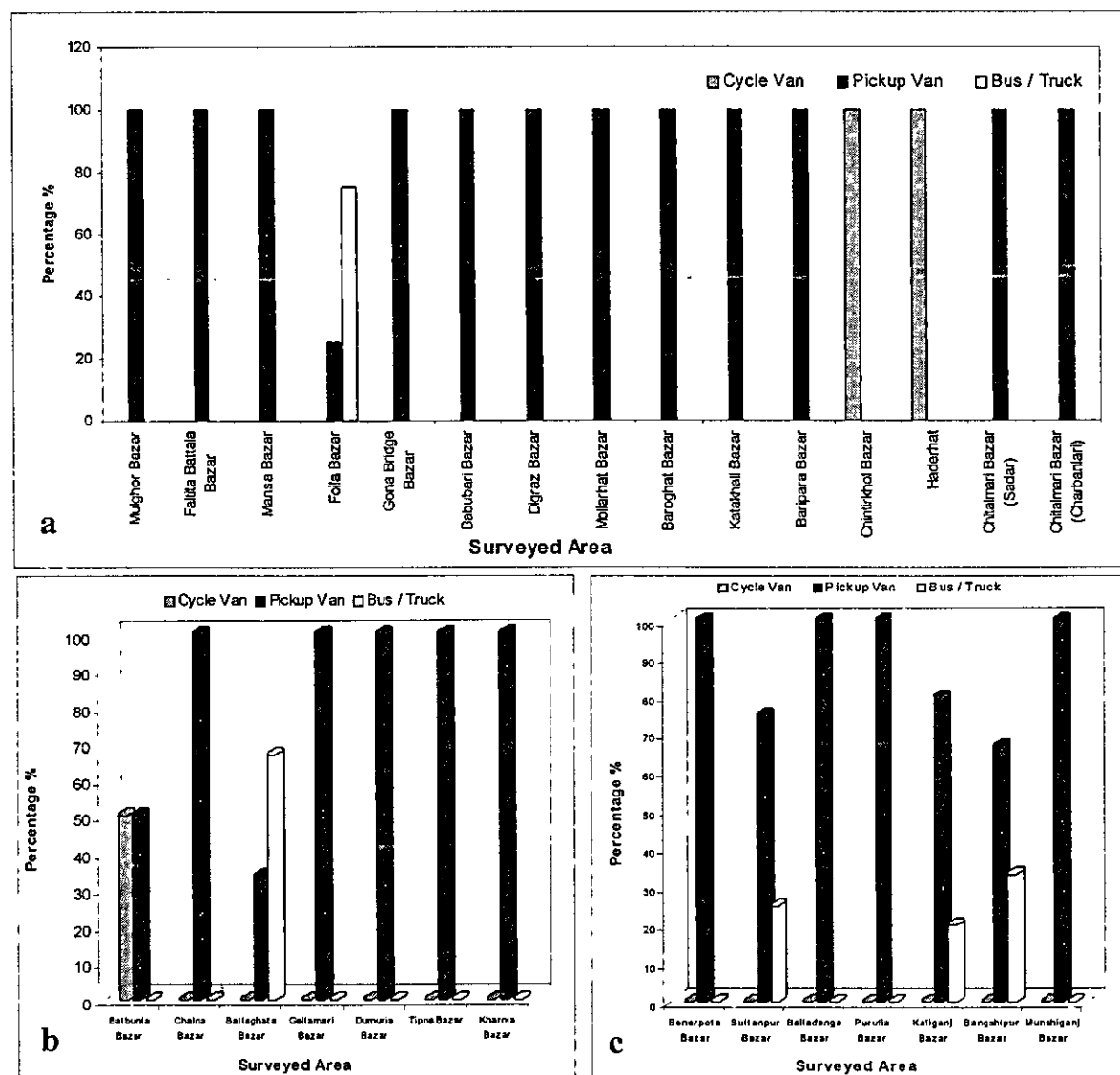


Figure 19: Transportation carrier used in depots (a) Bagerhat (b) Khulna (c) Satkhira

4.1.1.3.4.3 Route

Transportation routes for shrimp are shown in Fig. 20. In Bagerhat district, 100% routes were found to be of road (Brick/Pitch). All routes in Khulna district were similar to that found in Bagerhat district except for Batbunia Bazar, where river was also used as a route for transportation of shrimp from depot to agent. In Satkhira district, 100% routes were road (Brick/Pitch).

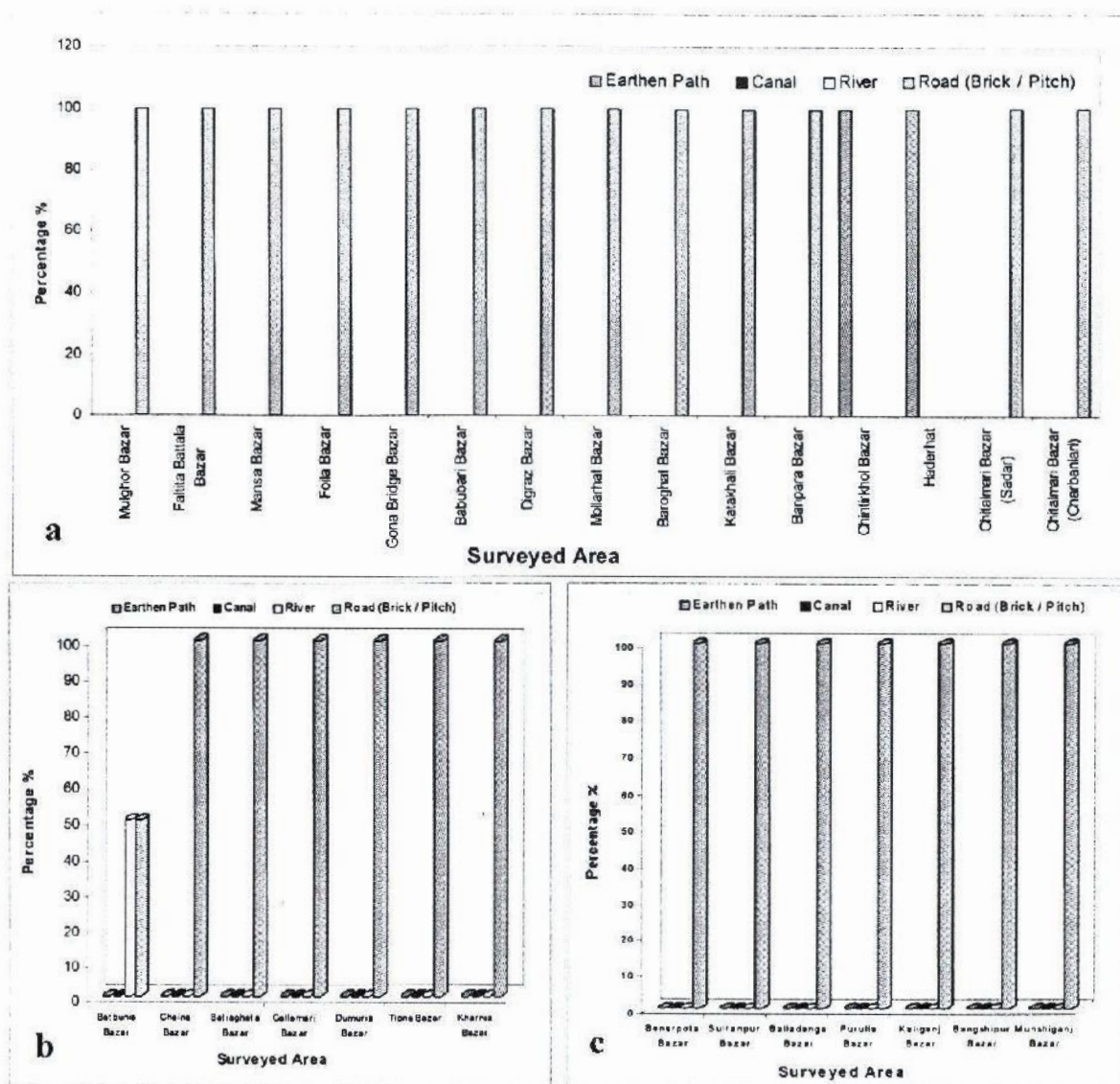


Figure 20: Transportation routes used in depots (a) Bagerhat (b) Khulna (c) Satkhira

4.1.1.3.5 Icing ratio

In depots, ratio of ice: shrimp varied between 0.5:1 to 2:1. In most of the depots in Bagerhat district, icing ratios were observed to be in the range of 1:1. Similar pattern of results were found in Khulna district. However, in Satkhira district, icing ratio varied and as high as 2:1 ratio was also found (Fig. 21).

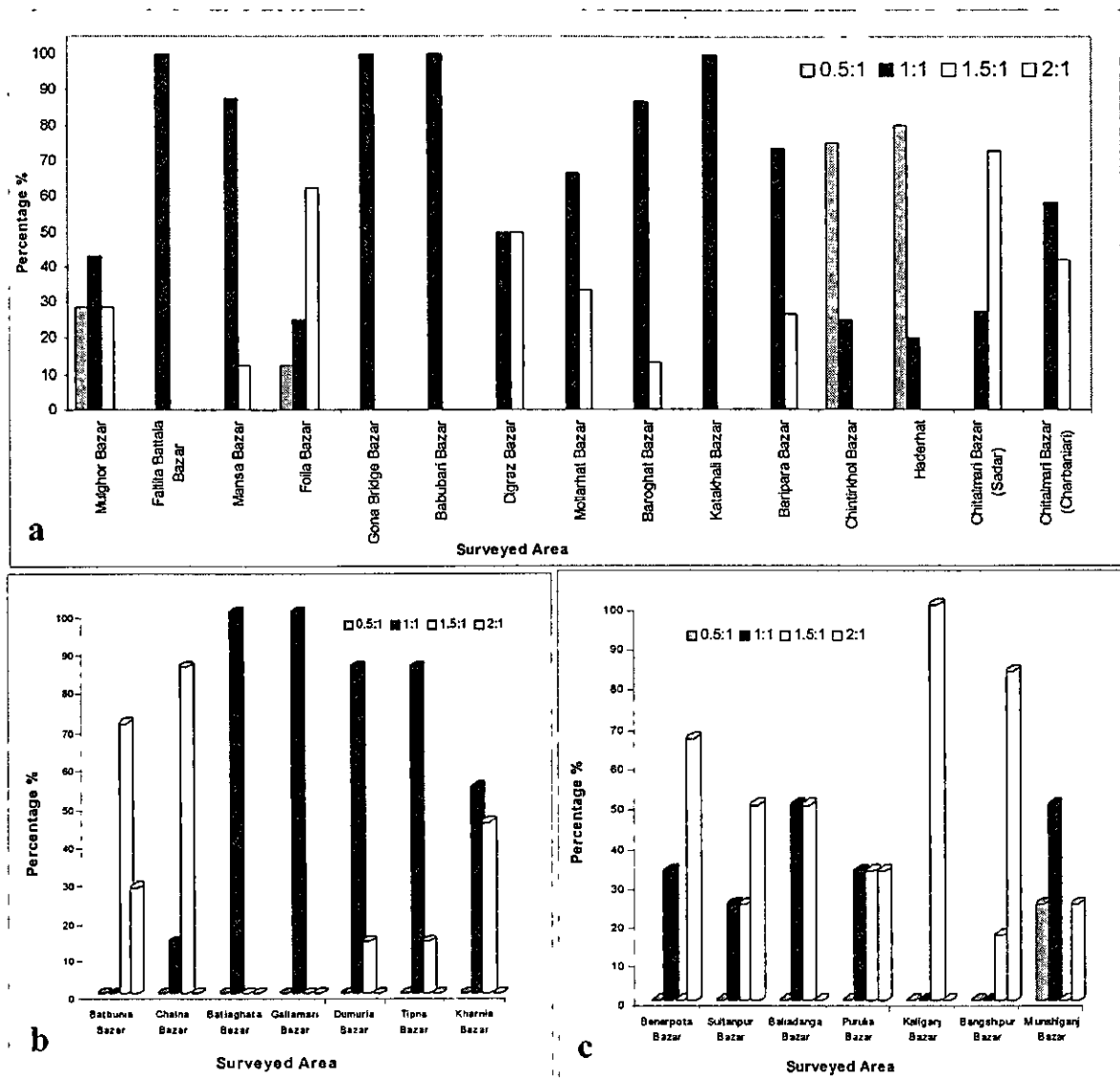


Figure 21: Icing ratio (ice: shrimp) used in depots (a) Bagerhat (b) Khulna (c) Satkhira

4.1.1.3.6 Ownership

Fig. 22 shows the ownership of depots. Depots were either self owned, rented or Government supported. Most of the depots in Bagerhat district were supported by Govt. while in Satkhira district depots were mainly rented or even self-owned. No government supported depots were found in Satkhira district.

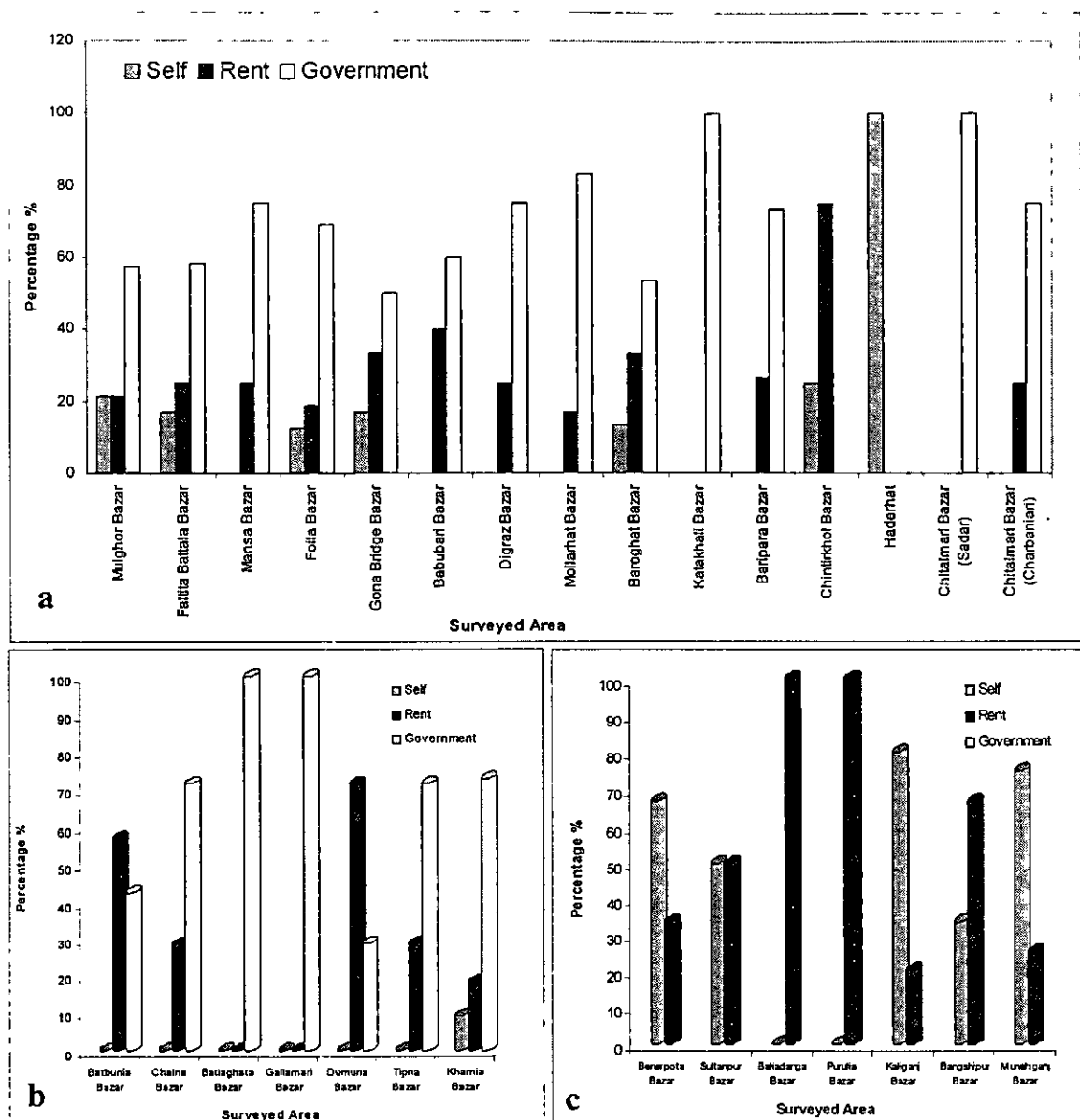


Figure 22: Ownership of depots (a) Bagerhat (b) Khulna (c) Satkhira

4.1.1.3.7 Manpower

People working in depots of the three districts are shown in Fig.23. In Bagerhat district, mostly male were found to be working in depots. Female were lower in number. A few children also worked. In Khulna district, male workers were much higher compared to female workers. Mostly male worked in depots of Satkhira district.

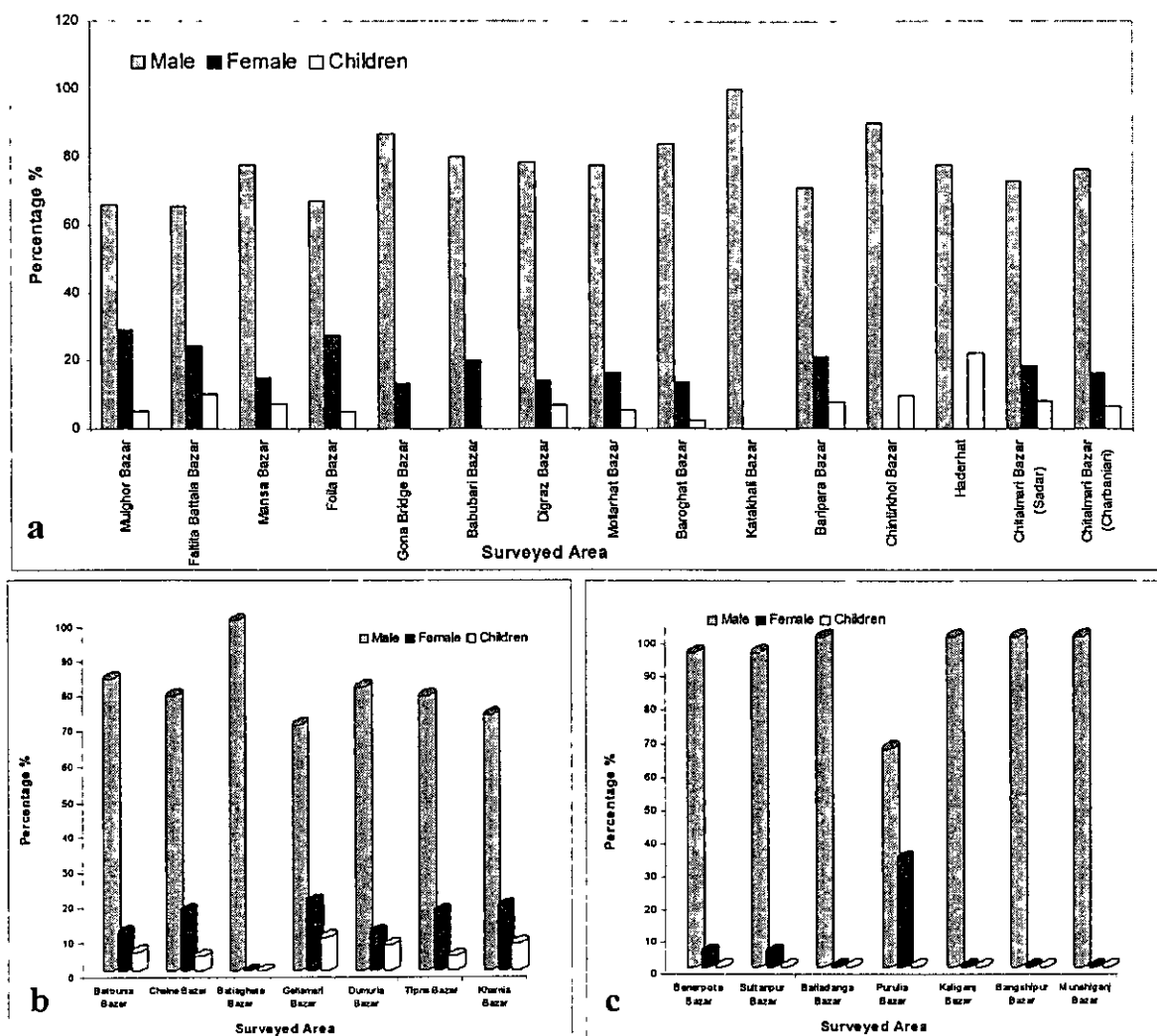


Figure 23: Manpower working in depots (a) Bagerhat (b) Khulna (c) Satkhira

4.1.1.3.8 Religion

A mixture of Hindus and Muslims worked in all the three districts in the depot (Fig. 24).

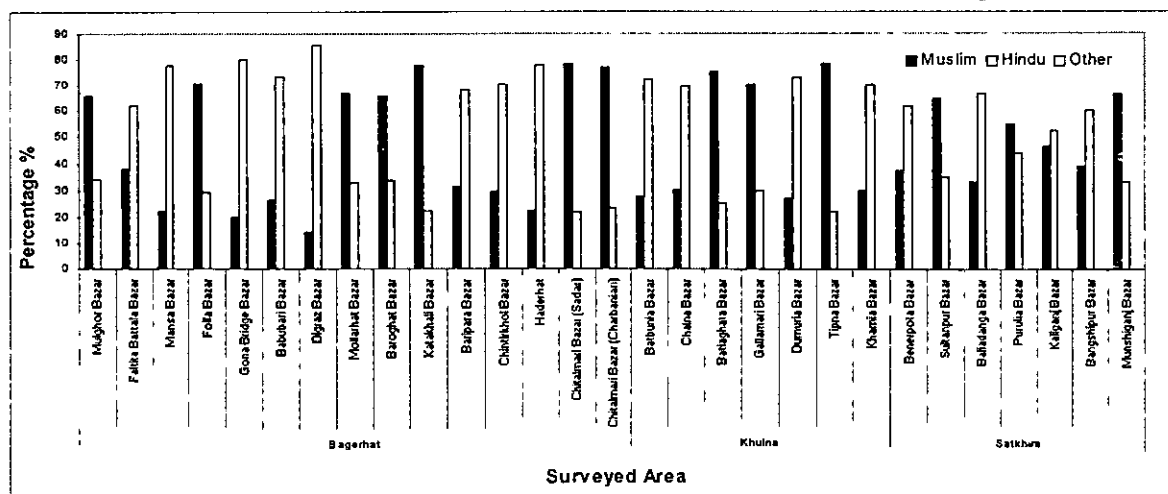


Figure 24: Religion status of manpower in depots

4.1.1.3.9 Education

In all the three districts, workers in depots were either illiterate or had primary or secondary education. Only in Satkhira district, a few workers in depots had tertiary education (Fig. 25).

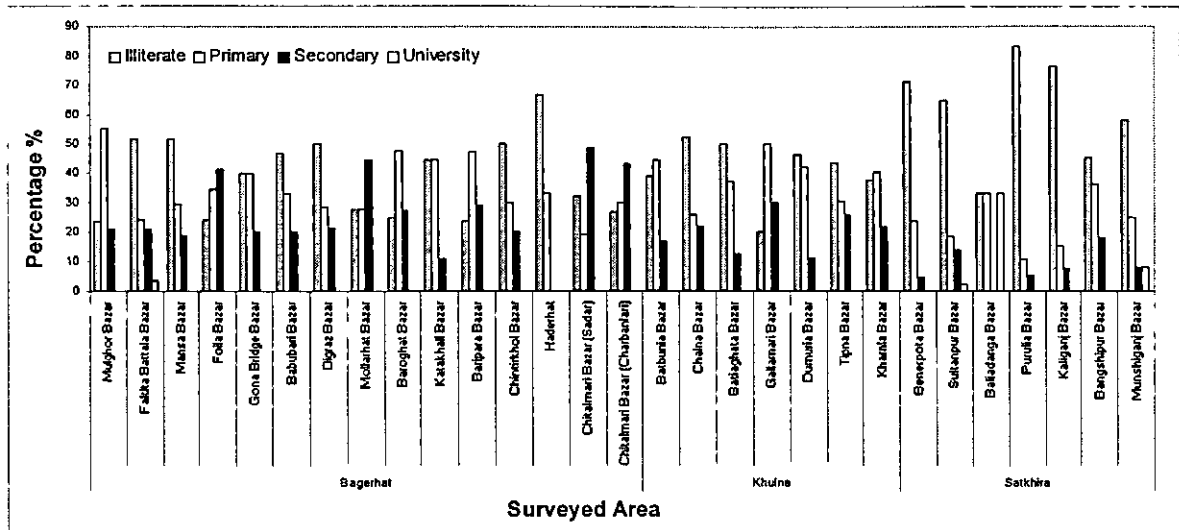


Figure 25: Education status of manpower in depots

4.1.1.3.10 Grading Spot

In Bagerhat district, grading was carried out in wooden platform mainly. Shrimps were graded in wooden platform, polythene or on floor in Khulna district. While in Satkhira district, grading was carried out in tin, in addition to the use of floor and wooden platform (Fig. 26).

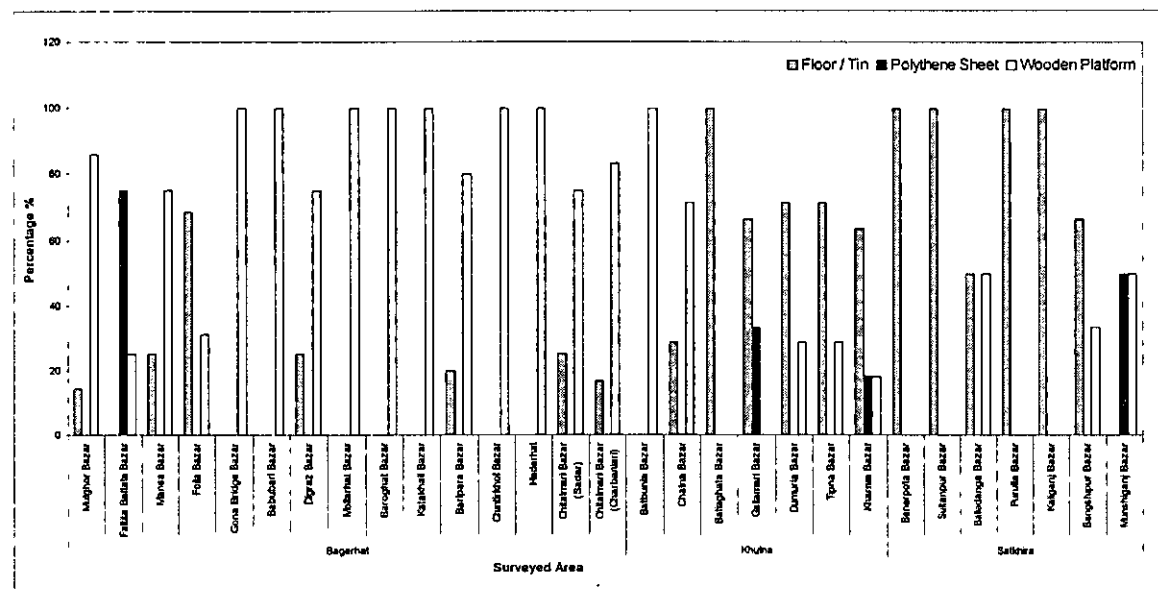


Figure 26: Grading spot in depots

4.1.1.3.11 Sources of washing water

Shrimps were washed by water taken from shallow tubewell in Bagerhat district; also water from ponds and canals were used. In Khulna district, sources of washing water were primarily from shallow tubewells. However, in Satkhira district sources of water were from deep and shallow tubewells including canal (Fig. 27).

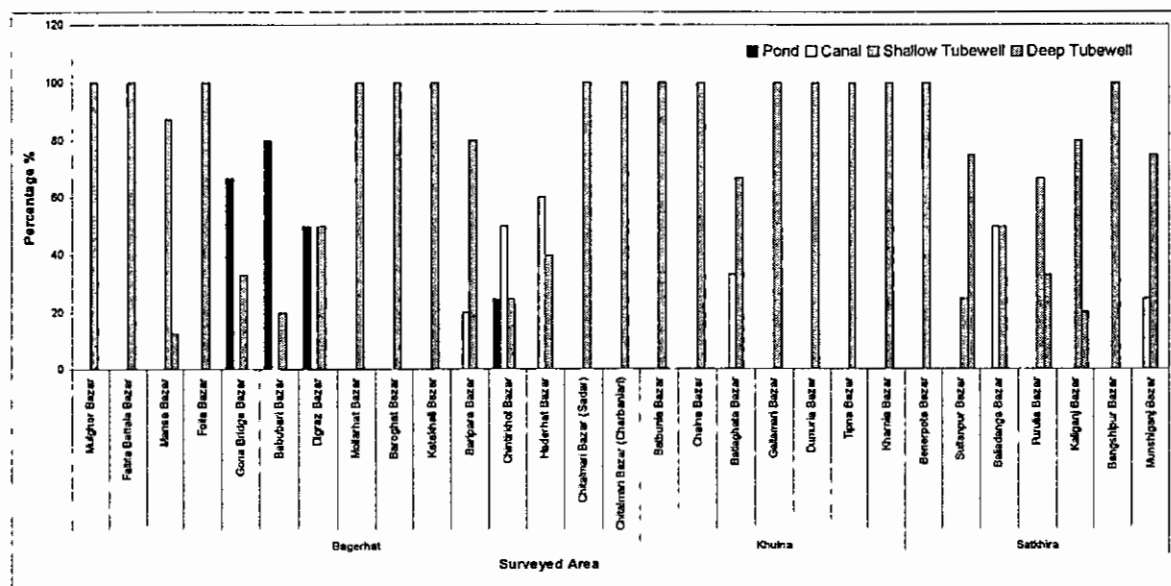


Figure 27: Source of washing water in depots

4.1.1.4 Agents

4.1.1.4.1 Salary

The salaries for personnel (manager, Accountant and others) working in agents (22) in Natun Bazar Launch Ghat is shown in Table 9. The salaries of manager, accountant and others ranged between 3,000-5,000, 2,000-3,500 and 1,500 – 3,000 Tk./month respectively.

Table 9: Salary range of workers in agents

Salary (Tk/month)		
Manager	Accountant	Others
3,000-5,500	2,000-3,500	1,500-3,000

4.1.1.4.2 Average Production

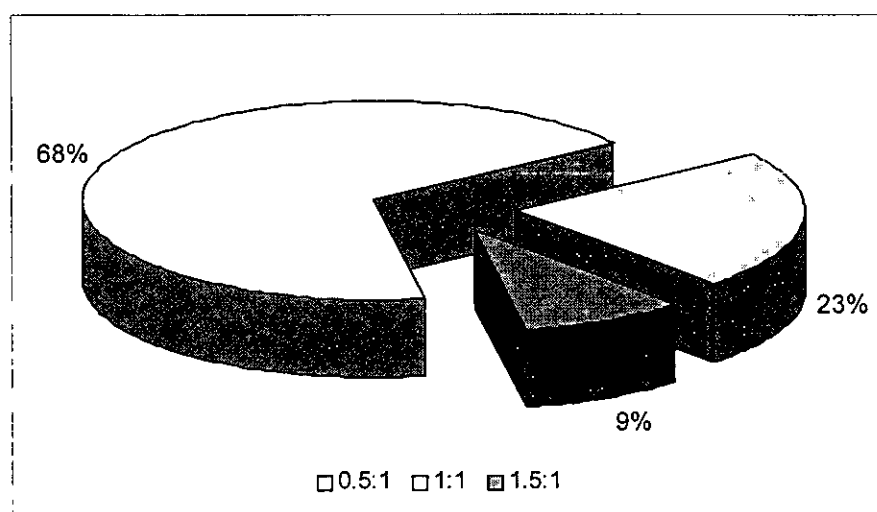
Average production observed in agents varied from season to season. The average production in the 22 agents in Natun Bazar Launch Ghat were found to vary between 6,650-10,890, 19,850-24,640 and 3,350-4,960 kg/day during pre-season, season and post season respectively (Table 10).

Table 10: Average production of shrimp in agents

Average Production of Shrimps (Kg/day)		
Pre-season	Season	Post-season
6,650-10,890	19,850-24,640	3,350-4,960

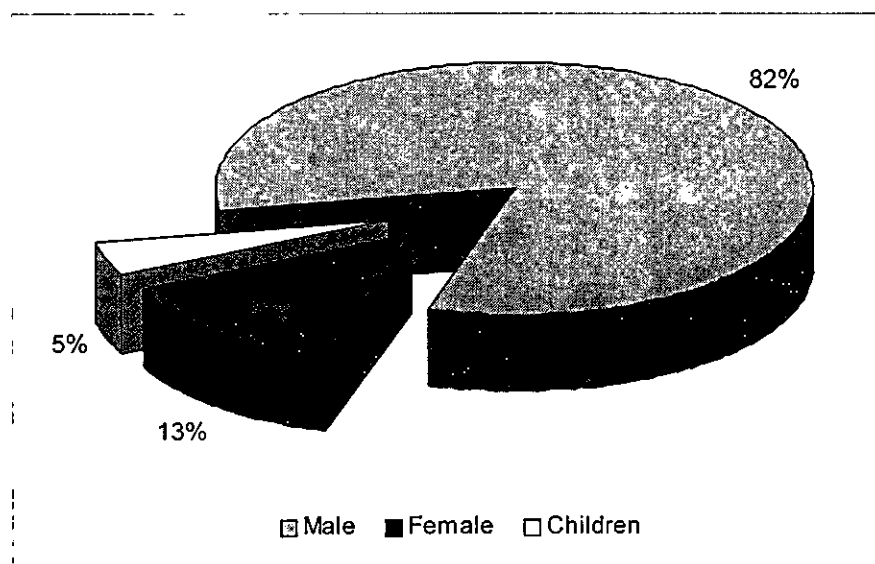
4.1.1.4.3 Icing ratio

Icing ratio was found to be high as observed in agents. 68% of agents used as high as 2:1 (ice: shrimp) rate. While 23% used 1:1 and 9% used 1:5 ratio (Fig. 28).

**Figure 28: Icing ratio (ice:shrimp) used by agents**

4.1.1.4.4 Manpower

82% of workers in agents were male while 13% were female. 5% children also worked in agents (Fig. 29).

**Figure 29: Manpower involve in agents**

4.1.1.4.5 Transportation

100% shrimp were transported from agents to processing plant only in plastic materials. Carriers of shrimp were van and pickup/truck, van being higher in number. The transportation routes were mostly through road (brick/pitch). However, about 30% of agents used river as a route for transportation (Fig. 30).

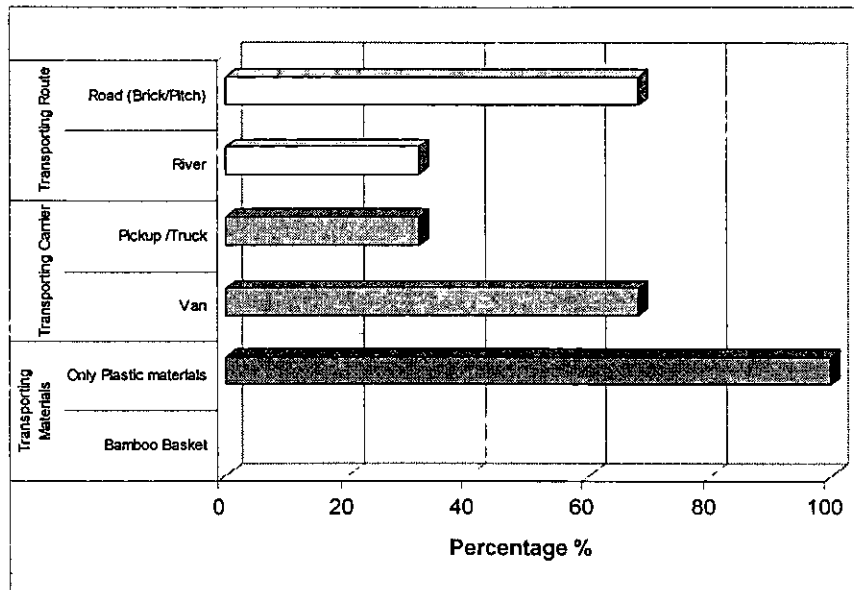


Figure 30: Transportation from agents to processing plant

4.1.1.4.6 Area of agent

32% of agents worked in an area of 500-600 sq.ft., being one of the lowest in relation to area. 27% worked in an area of 400-500 sq.ft. Only 9% worked in an area as high as 600 sq.ft. or more (Fig. 31).

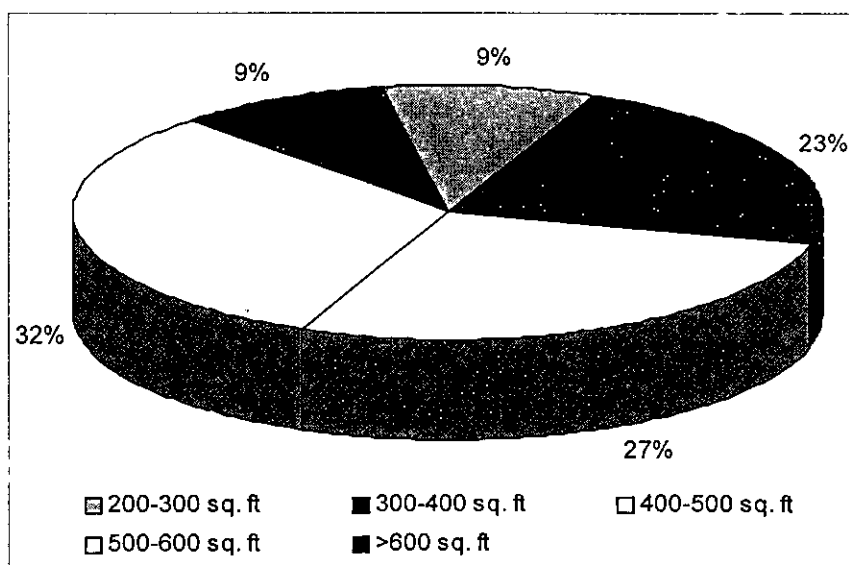


Figure 31: Area of agents

4.1.1.4.7 Physical structure

28% of agents had mosaic floor, 23% mosaic wall, 25% cement roof and only 5% and 3% had tin and wooden roof (Fig. 32).

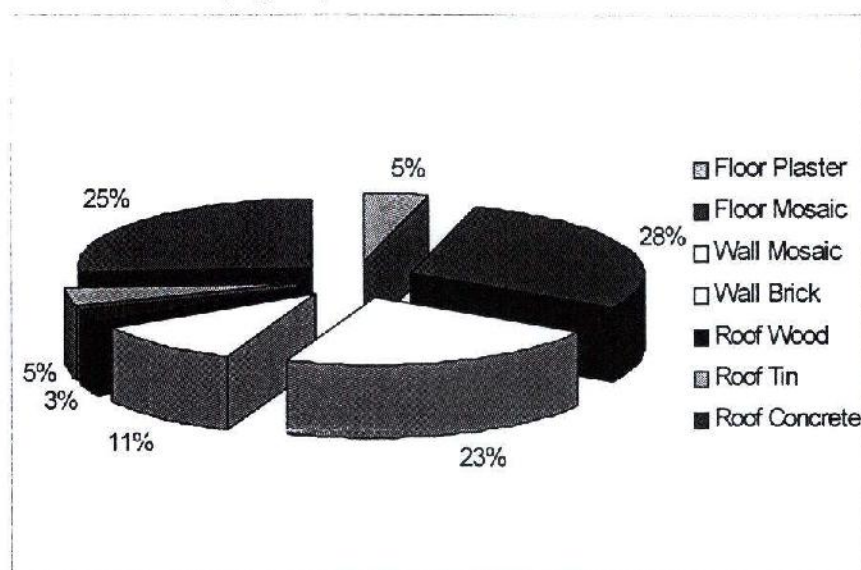


Figure 32: Physical structure of agents



4.1.1.4.8 Religion and education

Most of the workers in agents were Muslim (80%). Workers in agents had primary, secondary education while a few had university degree (Fig. 33).

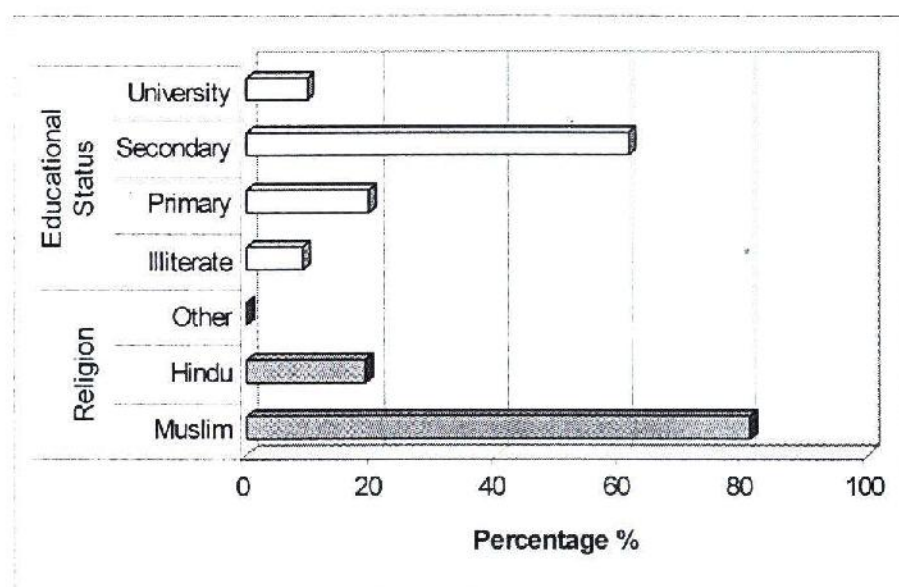


Figure 33: Religious and Educational status of workers in agents

4.1.1.5 Processing Plant

4.1.1.5.1 Area

The area at the receiving room of 37% processing plants was greater than 300 sq. ft. Most of the processing plants had receiving room with an area which ranged from 150-250 sq. ft. (Fig. 34).

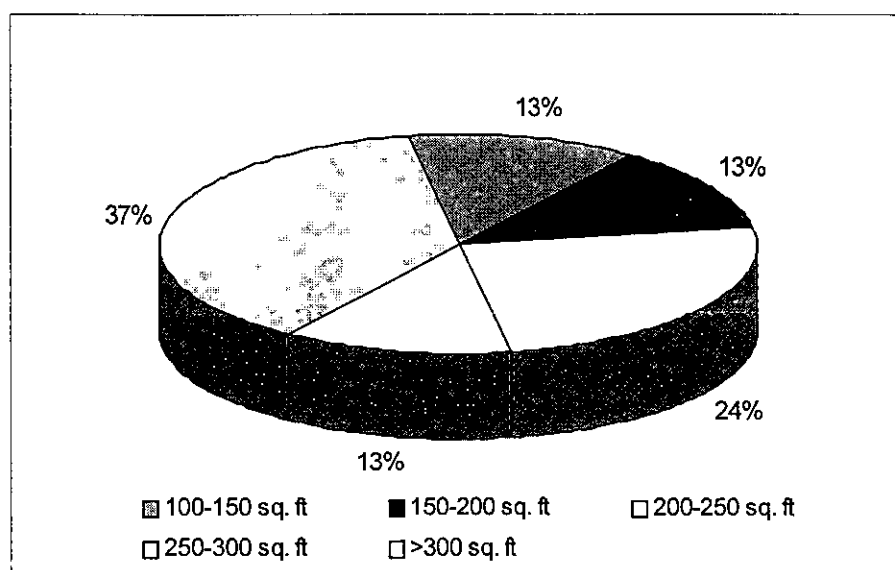


Figure 34: Area of receiving room (Processing Plants)

4.1.1.5.2 Icing ratio

Shrimp at the ratio of 1:1(ice: shrimp) were used in the receiving room in 87% processing plants. Rest of the processing plants used ice at a ratio of 0.5:1 (ice: shrimp) (Fig. 35)

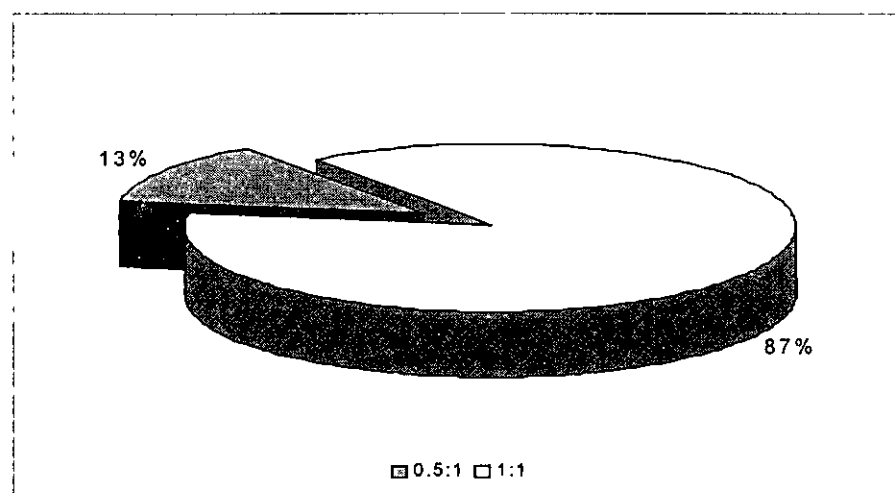


Figure 35: Icing ratio (ice:shrimp) used in processing plants

4.1.1.5.3 Quality assessment

In 62% of processing plants, shrimp were immediately taken from receiving room for quality assessment particularly in relation to organoleptic and microbiological parameter (Fig.36).

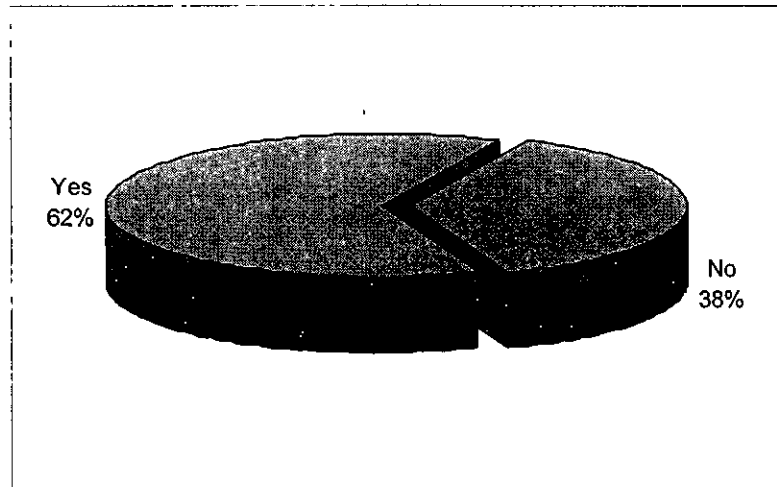


Figure 36: Shrimp quality assessment status

4.1.2 Handling period of shrimp (from gher to processing plant)

This is one of the most vital areas studied in the investigation. Table 11 show the surveyed areas and the time taken (hours) at each level of marketing channel. In gher, handling period varied between 0.5-2 hours with an average of 0.5-1 hour. About 0.5-3 hours were taken by fariars. Longer period were observed in depots as pre-processing were carried out. This time varied between 2-4 hours. However, as shown in Table 11, as high as 8-12 hour were also observed in Betbunia Bazar depots in Khulna district. While shrimps were brought to agents, the handling period ranged from 0.5 to 2.0 hour. At the receiving room of the processing plants, handling period was between 1-2 hour. Taking into consideration the approximate average of all the points, the total handling time from gher to processing plant (1 hour for gher, 1.5 hour for faria, 3 hour for depot, 1 hour for agent and 1.5 hour for processing plant) would be 8 hours.

Table 11: Shrimp handling period

		Handling Periods of shrimp (Hours)				
Surveyed area		Ghers	Farias	Depots	In agents of Natun Bazar, Khulna	In Processing Plants of Rupsha, Khulna
Bagerhat	Mulghor Bazar	0.5-1	1-2	2-4		
	Faltita Battala Bazar	1-1.5	1-2	3-5		
	Mansa Bazar	1-2	1-2	4-5		
	Foila Bazar	0.5-1	2-3	3-5		
	Gona Bridge Bazar	0.5-1.5	1-2	4-5		
	Babubari Bazar	0.5-1	1.5-2	4-5		
	Digraiz Bazar	0.5-1	0.5-1	5-6		
	Mollarhat Bazar	0.5-1	1-2	3-5		
	Baroghaz Bazar	0.5-1.5	1-2	4-5		
	Katakhali Bazar	0.5-1.5	0.5-1.5	3-5		
	Baripara Bazar	1-2	1.5-2	3-5		
	Chintirkhol Bazar	0.5-1	-	2-3		
	Haderhat	0.5-1	-	2-3		
	Chitalmari Bazar (Sadar)	0.5-2	0.5-1.5	3-5		
	Chitalmari Bazar (Charbanjari)	0.5-2	0.5-1.5	3-5		
Khulna	Batbunia Bazar	1-2	2-3	8-12	0.5-2	1-2
	Chalna Bazar	0.5-2	1.5-2.5	4-6		
	Batiaghata Bazar	0.5-2	-	3-4		
	Gallamari Bazar	1-2	-	1-3		
	Dumuria Bazar	0.5-1	1-1.5	2-4		
Satkhira	Tipna Bazar	0.5-1.5	1-2	2-3		
	Kharnia Bazar	0.5-2	0.5-2	3-5		
	Benierpota Bazar	0.5-1	0.5-1	2-4		
	Sutanpur Bazar	0.5-2	1-2	2-6		
	Baliadanga Bazar	0.5-1	0.5-1	2-3		
	Parulia Bazar	0.5-1.5	2-5	2-5		
	Kaliganj Bazar	0.5-1	1-2	1-4		
	Bangshipur Bazar	0.5-1.5	1-3	2-3		
	Munshiganj Bazar	0.5-1	1-2	2-5		

7.2 Visual quality of shrimp in the marketing channel in Khulna region

7.2.1 Organoleptic

Visual organoleptic quality of shrimp was evaluated by parameters such as odor, carapace color, carapace texture, eye and shell color. An over all acceptability score was also recorded. This was done for shrimps collected at Gher, Depot, Agent and Processing plant. Fig. 37 includes the results. It was observed that under both the conditions, quality of shrimp were highly acceptable when collected at the Gher but reduced in relation to all parameters as it reached the processing plant (moderately accepted).

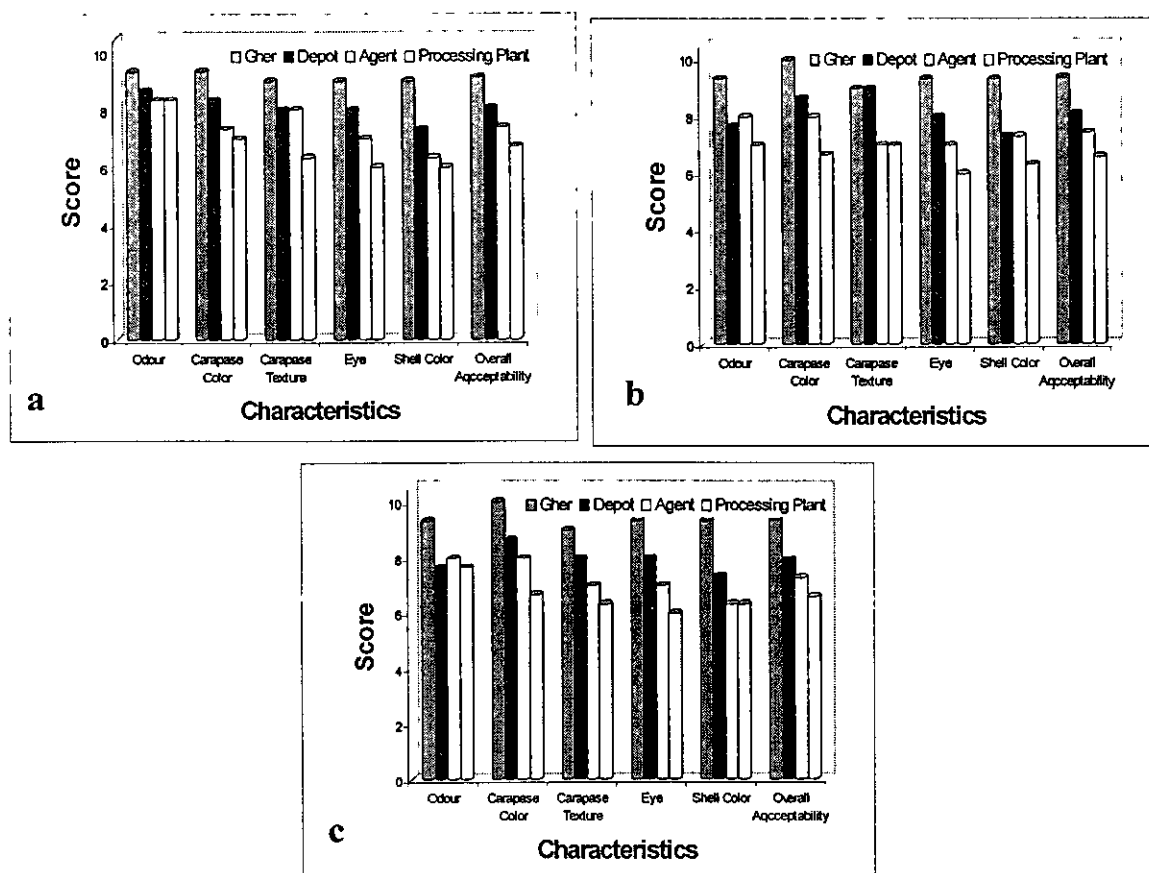


Figure 37: Organoleptic score of shrimp in different districts (a) Bagerhat, (b) Khulna and (c) Satkhira.

5.0 DISCUSSION

The research intended to integrate between the quality of shrimp at different marketing channel and the socio-economic status of the fisher community in Khulna region. As a result, the investigation in its initial phase identified the principal stakeholders in the marketing channel. A stakeholder has been identified as one who has an interest in or is affected by the operation of shrimp farming activities and therefore has a natural right to participate in decisions related to it. The background of this study reflected that there was need to identify and involve all stakeholders in management concern to ensure that all interest are catered for and also that the results will be accepted by all actors. The stakeholders in the shrimp marketing channel in the present investigation were identified in Ghers, farias, depots, agents, processing plants.

The study was carried out in two phases. In the first phase, the socio-economic status of the stakeholders in the shrimp marketing channel was studied. While in the 2nd phase, quality of shrimp in relation to organoleptic, biochemical and microbiological parameters at each level of marketing was done. This was then compared with a controlled study where ice : shrimp (1:1) were used throughout the marketing channel.

The investigation covered three districts in Khulna region i.e. Bagerhat, Khulna and Satkhira. The first task of the investigation was to identify different marketing channel in the three districts and a generalized marketing channel has been shown in Fig. 2. The study focused on key indicators such as physical structure, ownership, production, icing system, processing system, source of funds, transportation, manpower, salary, education, religion etc.

Transportation was one of the major concerns in the shrimp marketing channel and the factors that were particularly looked at were materials, carriers and routes. Shrimps were distributed from Gher to Depot mainly in aluminum pots (Fig. 4). Other materials such as bamboo basket, bag and plastic baskets were used to a lesser extent. Plastic materials were used widely in Satkhira district (Kaliganj bazar) (Fig. 4). For the shrimp to be transported, it is always suggested that plastic materials must be used. Infrastructures for carrying shrimp were not satisfactory both in terms of carrier and route. Shrimp from Gher to Depot were carried either by bi-cycle or by hand/head in all the three districts (Fig. 4). In Satkhira district, relatively substantial amount of shrimp were distributed by van. But those carriers were not fast enough to reach the destination nor were there any means to keep the temperature of shrimp lower as would have been observed if refrigerated vans or banana leaves/water hyacinth were used on the top of transportation materials. Roadways or routes through which shrimp were distributed from Gher to Depot included earthen pathways mainly and in some cases canals. Better means of infrastructure is expected for the shrimp to reach depot at the minimum time. No ice was used for shrimp harvested and provided to faria.

Faria also used vans for transportation. Bi-cycles were used only in few places. Again aluminum pots were used for carrying shrimp. A few farias used non fair trade practices by keeping the shrimp in water overnight to gain weight of shrimp. This would not only increase the holding time but also resulted in spoilage quickly. The roadways for shrimp to reach its destination were mostly earthen pathways. Transportation systems as a whole in the studied area were relatively unsatisfactory and need to be improved. Shrimp from depots to agents were usually transported in plastic drums covered with ice in different ratios in pickup vans mostly.

Shrimp were transported in plastic drums from agents to processing plants. However, vans and pickup trucks were generally used for transportation. The distance from agent to processing plant was not much. But in some cases rivers were used as a route for transportation (Fig. 30). Thus it is suggested that in these cases motorized boats should be used to cover the distance in the minimum time.

Icing ratio used by farias, in depots, agents and in processing plants varied widely. These variations ranged from 0.5:1 to 2.0:1.5. However, the quality of shrimp irrespective of the ratio used had been more or less same at all points of marketing channel. It is yet to understand the precise ratio of ice to shrimp to be used. In the controlled experiment (later explained), there were no variation in organoleptic, biochemical or microbiological quality of shrimp which had been collected from different point of marketing channel (maintaining ice: shrimp ratio 1:1 throughout) compared to shrimp collected as normal practices. Further work is also needed to understand as to when to use ice. It is still a debate in the tropical countries whether to ice shrimp/fish immediately after harvest or to delay for a particular period, keeping shrimp under the cover of leaves/other materials and then to ice (Azam, 1990). Shrimp iced approximately 8 hours after capture remained acceptable organoleptically for 12 days. It is also to be mentioned here that shrimp iced immediately had a shelf life up to 17 days while 4 hour, 8 hour and 17 hour delayed iced shrimps had shelf life of 16, 13 and 11 days respectively (Jayaweera and Subasinghe, 1990).

Use of ice on the floor was observed in many of the depots. However, many depots in the three districts had mosaic floor. It is indeed advisable that icing and grading spot should be done in clean area.

Sources of water for washing shrimp either by farias, or by agents were from Gher, pond, river, and canal etc. Depots and agents used water mainly from shallow or deep tubewell for washing shrimp. Quality of shrimp invariably depends on the quality of water sources. Shrimp quality would rather be affected if washed with unhygienic water (Lobrerria *et. al.*, 1990; Fonseka, 1990).

Most of the workers were male while relatively lower number of female worked at all points of marketing channel. A few children also worked. Both Hindus and Muslims

worked, Muslims outnumbering Hindus. Most of the workers were illiterate, some having primary or secondary education. However, a few workers in agents had tertiary education. Salaries of the workers were not satisfactory. Only those working in agents were paid relatively higher salary. But as a whole, the workers were poorer. It is very important here to mention that agents (owner) were very rich and powerful and exercised their market power in the whole shrimp marketing channel.

Depot structure (wall, floor and roof) were rather fairly satisfactory. However, when the present investigation was carried out, a dramatic change occurred in depot structure. As the Govt. and the Department of Fisheries took staunch action to rebuild the depots, they looked much better. Physical structure observed for agents were also satisfactory. The receiving rooms of most of the processing plants were hygienic and very satisfactory.

One of the most striking point in the study was the handling period of shrimp from harvest (Gher) to processing plant. As already stated in the result (Table 11), that the average handling time from Gher to Processing plant was 8 hours. If infrastructures were improved, this period could easily be reduced to half the present time (4 hours). In this case, if shrimp were handled properly (with appropriate ice: shrimp ratio and known time of icing), there would be been complete assurance of shrimp quality by the time it reached the processing plant.

The present investigation tried to study the socio-economic status of the stakeholders in the shrimp marketing channel. The study did indicate that the stakeholders (other than owner of agents) were poor. The investigation took into consideration an approach to improve their livelihood. This was done indirectly as a controlled study was carried out where shrimps were maintained in ice at a ratio of 1:1 (Ice: Shrimp) throughout the marketing channel. A cool chain was maintained. It was expected that the quality of shrimp would improve to a greater extent and therefore the earning of the stakeholders (General workers) would be enhanced through better profit.

Quality of shrimp did not differ much as practiced normally at present in comparison to controlled study. As a result, the hypothesis that the livelihood status of the stakeholders would improve through better quality of shrimp was rejected. The clear evidence for improving the livelihood of the stakeholders could rather be identified in the marketing channel (Fig. 2) although a few other factors also could be responsible.

Gher owners were numerous, very dispersed and lacked financial capital and access to good information. For all of these reasons, they had little opportunity to collude to influence the market but they may be susceptible to the collusive practices of others-farias, depot owners and ultimately the agents.

Two types of stakeholders performed the function of bulking up shrimp, transporting and pre-processing i.e. faria and depot. Faria were independent poor stakeholders who negotiated with gher owners and brought shrimp to depot. While depot (small or large)

processed shrimp, as demanded by agents and transported them to Khulna market (Agents).

When we focus in the generalized shrimp marketing channel, we find agents as one of the most vital stakeholders. Agents organized the wholesale marketing of shrimp and secured their income from commission charged to sellers and interest or loans made to suppliers. The agents had a dominant position in the market which they exercised to their advantage i.e. they manipulated prices to secure high returns for themselves. Agents were certainly in a stronger position to exploit the other participants in the marketing chain. They also had access to greater financial capital resources and other participants in the marketing chain, both sellers and buyers, borrowed from them. Agents were in general financially well rewarded. Agents received high income and their income included elements for both marketing service they offered and the money lending service.

Agents charged a commission of 2% or more on sales by independent customers and 5-7% on sales by borrowers. Thus, the interest charged on advances was very high. The role of agents in the shrimp marketing channel was therefore undoubtedly questionable. Is there a better alternative in the sense of improving resource allocation? Could there be alternatives such as provision by NGO's or commercial/public banks to provide credit to other stakeholders at a minimum and/or without interest rate? Also, could the Govt. (Department of Fisheries) play a role in preventing the agents to control the total market in the shrimp marketing channel? Could there be approaches or strategies made by Govt. to minimize the market power of agents so that shrimp be supplied directly to processing plants from depots?

This study definitely identified 'Agents' as a major factor in preventing the enhancement of livelihood of the stakeholders. Other factors that could add to enhance the livelihood status of the stakeholders were to provide the stakeholders the basic education on shrimp quality, fund and maintain cool chain throughout the marketing channel. Shrimp is mainly for export as Bangladesh earns substantial amount of foreign exchange. Thus, the country has to cater for the need of the buyers in the international market. The importers are not only satisfied with quality now. They would like to see that the product has a 'Seal of Quality' brand certified by a third party which is internationally recognized. The 'Seal of Quality' encompasses traceability, food safety, human rights violation, fair trade practices, environment friendly product. ATDP (Shrimp Foundation), an NGO, has taken a driving seat to implement 'Shrimp Seal of Quality' in Bangladesh recently. The stakeholders in the shrimp marketing channel must be made aware of 'Seal of Quality'.

The level of exploitation by traders, en-operation, and associations is highly discrete, controversial and undesirable. The generalized complaints which appear in the Bangladesh literature of fisheries development regarding the exploitation of fishermen by intermediaries appear to hinder the development of industries. However, opportunities

for unscrupulous dealings and exploitation still occur rigorously along marketing channel. Generally, these opportunities are increasing in the markets where there is effective competition between buyers and sellers individuals (faria) are constantly on the lookout for the chance to earn easy money. The exploitation of fishermen by fish dealers (agents), especially those dealers who have extended loan facilities, opportunities exists throughout the marketing chain for unfair dealings which many times verge on the fraudulent. The common occurrences are having observed in the landing/marketing places are underweighting, misquoting prices of the auction and wrongly placement of graded fish. Opportunities for these mal-practices arise in nearly all markets. When a wholesaler is receiving consignment of fish from a number of intermediaries he may not be able to identify at which price each consignment was sold. Ideally, the average price for the day should be quoted, but the dealer may not be sure what this is unless careful accounts are made. The supplying intermediaries and fishermen are likely to be less aware of this practice than the dealer.

This type of malpractice is less likely to occur when the suppliers are able to cross-check market prices, when he has alternative outlets which offer a competitive check to exploitation and when market intelligence is developed.

A further source or method of exploitation exists when fish is not weighed but is sold by container, basket, pan, box or pile, If subsequent sale is done by weight, the supply intermediary or fisherman has no means of comparing the market value of his fish. However, even when fish is weighed at landings methods of weighing may be subject to sleight of hand/finger or other tricks manipulated by faria. When grading occurs, as with the more valuable species, intermediaries may downgrade fish taken from fishermen but sell at a higher grade. Apart from price and weight the fishermen may suffer at the hands of monopolist suppliers of ice, nets, boats and other gears. Monopoly in ownership of ice plants appears to be a common feature of the fishing industry in southwester part of the country. Throughout the fishing industry in Bangladesh, opportunities for exorbitant pricing are prevalent and thus the markets get restricted. Many of these eventually be improved by government can, by its standard policies, unwittingly create conditions which may eventually operate in restraint of trade and to the detriment of the fishermen, various licensing schemes may be introduced by DOF, such as vessels, lorries, Import of capital items and gear and export of fish can be open to abuse if they outlive the reasons and objectives if the regulations are implemented with sufficient supporting control measures to enforce them.

The relationship between fishermen and intermediaries may be improved in favor of the fishermen by institutional developments. The most important of these are the fish marketing organization or co-operatives societies along the numerous types of government loan schemes to fishermen and vessel owners. Since traditional fish marketing is linked with the provision of credit unless fishermen, are provided with credit they will condition to borrow from traders/financiers and thus be obligated to them to trade in their catch. The reasons for the commercial failure of parastatal fish marketing organizations due to the fact that they are staffed by bureaucrats who don't have either the incentive or the initiatives to take risks, changes in fish prices are so often, perhaps requiring decisions several times a day, the public servant of Bangladesh government don't tend to face such flexibilities. They always tend to be overstaffed and work at home. For these reasons, they are easily twisted by private traders.

There is no dearth of information regarding the problems, issues, constraints and opportunities in sustainable development and management of shrimp sector in Bangladesh. Given the economic and ecological significance of shrimp resources, they have been the subject of a large number of studies. While these studies have identified problems, issues and constraints, they are silent on how to integrate stakeholders, institutions and community-based approaches into the management of shrimp resources. A lack of coordination among the stakeholders is a common feature in the shrimp marketing channel. Institutional indifference due to the ambiguity of jurisdictions has in many cases resulted in counterproductive and conflicting development activities. Collaborative partnerships among the stakeholders mandated by legislation may be an option for addressing the institutional quagmire. Institutionally, neutral national and international NGOs would be in a unique position to facilitate the development of such collaboration.

The ultimate goal of all efforts to improve livelihood status and alleviate poverty by better use of resources must be seen in the development of self-confidence and self-reliance, local leadership elected and controlled by the local people to make best possible and prudent use of the resources for local development, keeping in mind that non-renewable resources cannot be consumed without being lost for ever. Such resources must be regarded as something held in trust for the next generations, as a fund which, if properly invested, bears interest. Only interest can be consumed while the capital stock has to be kept intact or even increased (Bakhit *et. al.*, 1996). Sustainable livelihoods is a framework for thinking about poverty by trying to understand and analyze the lives and needs of the poor and identify key opportunities that will ultimately benefit them. (Kleih *et. al.*, 2003)

6.0 RECOMMENDATION

Gher

- **PP: Ice** is not usually used after harvesting
- **Re: In-depth research** is required when to use ice and at what ratio
- **PP: Bamboo baskets, aluminum materials** etc. are usually used for holding harvested shrimp
- **Re: Plastic materials** should be used
- **PP: Sale of shrimp at the point of gher is complex.** Why? Bidding and direct supply system, money return etc.
- **Re: Either bidding system (gher owner/faria) has to be standardized** or supply directly to the depot should be **controlled** and money return to the farmer has to be ensured in time
- **PP: Non-fair trade practice** by gher owner. How ? Keeping the harvested shrimp in water for overnight or injecting weight- gaining materials into the shrimp
- **Re: Fair trade practice** should be ensured by adhering to strict rules and regulations. Increasing public awareness is also encouraged
- **PP: Most of the gher**s are situated in remote areas without having proper transportation system
- **Re: Transportation system** should be improved
- **PP: Product is not marked for traceability**
- **Re: Product** should be marked for traceability before transport from gher to faria or depot

Faria

- **PP: Purchasing power of faria is limited**
- **Re: Fund allocation** (loan/credits) for faria should be increased
- **PP: Most of the farias** do not usually ice in **appropriate ratio**
- **Re: Icing** should be done by faria in appropriate ratio (**Research** needed to find out the ratio of ice: shrimp)
- **PP: Non-fair trade practices** by faria. How? keeping the shrimp in water for overnight or injecting weight-gaining materials into the shrimp
- **Re: Fair trade practices** should be ensured by strict laws
- **PP: Product** not marked for **traceability**
- **Re: Product** should be marked for traceability before transport from faria to depot

Depot

- **PP:** Structure of most of the depots were fairly satisfactory
- **Re:** Structure of the depots should be improved further

- **PP:** Many depots situated in remote areas do not use **hygienic water** as they have no access to get better supply of water
- **Re:** **Hygienic water** supply should be ensured (**Research** at this stage should be done to find out the quality status of shrimp)

- **PP:** Shrimp **processing, grading, icing** activities are all carried out on the floor
- **Re:** **Processing, grading, icing etc should be carried out in hygienic condition**

- **PP:** **Hand gloves, gumboots** etc not used during processing activities
- **Re:** **Needful dressing** should be ensured (**Research** is needed for the quality assurance)

- **PP:** Most of the depots still use **bamboo baskets, polythene sheets or aluminum materials** for holding shrimp with inappropriate ratio of ice
- **Re:** Use of **plastic materials** should be ensured with appropriate ratio of ice (**Research** needed)

- **PP:** Some of the depots have workers **below 18 years** and sometime workers have to work **more than 8 hours** (up to 15 hours) especially during the peak season. However, the **salary** paid is far below (**Human rights violation**)
- **Re:** International labor law **should be implemented**

- **PP:** **Transportation system** from some depots to agents is not satisfactory (e.g. the transportation system from Dacop to Khulna)
- **Re:** **Transportation system should be improved**

- **PP:** Some depots do not carry out **environment friendly** activities (e.g. throw of wastes adjacent to the depot)
- **Re:** **Environment friendly** activities should be implemented.

- **PP:** Product is not marked for **traceability** in depots
- **Re:** Supply of product from depot to agent should be marked with specification for traceability. Also **research** is needed to ensure the quality status of the product at this stage

- **PP:** Depots are completely under the control of agents with regard to **transition**
- **Re:** GoB, NGOs, Donor agencies etc can play important role in **credit facilities**

Agents

- **PP:** Agents are the most **powerful stakeholders** in the shrimp marketing channel. Thus they can change the marketing system when they require
- **Re:** The **strength** of the agents should be minimized
- **PP:** No strict regulation regarding **commission** for agents from the depot owners
- **Re:** Proper **rules and guidelines** should be ensured.

Overall

- ☐ All stakeholders in the shrimp marketing channel should come under **one apex body**
- ☐ A **well organized team** with relevant background should be formed to monitor the complete shrimp marketing channel
- ☐ All stakeholders should be guided with **adequate scientific knowledge** from time to time (workshops/seminars/training etc)

PP: Present practices; Re: Recommendations

7.0 CONCLUSION

Agents were certainly in a stronger position to exploit the other participants in the marketing channel. They also had access to greater financial resources than the other stakeholders in the marketing channel, both sellers and buyers, borrowed from them. Agents were in general financially well rewarded. Agents received high income and their income included elements for marketing service they offered and the money lending service. The role of agents in the shrimp marketing channel was therefore undoubtedly questionable. Is there a better alternative in the sense of improving resource allocation? Could there be alternatives such as provision by NGOs or commercial/public banks to provide credit to other stakeholders at a minimum service charge? Also, could the Govt. (Department of Fisheries) play a role in preventing the agents to control the total market in the shrimp marketing channel? Could there be approaches or strategies made by Govt. to minimize the market power of agents so that shrimp be supplied directly to processing plants from depots? This study definitely identified 'Agents' as a major factor in preventing the enhancement of livelihood of the stakeholders. Other factors that could add to enhance the livelihood status of the stakeholders were to provide the stakeholders the basic education on shrimp quality, fund and maintain cool chain throughout the marketing channel. It is most unfortunate that very few analytical socio-economic studies have been done in the fisheries sector particularly almost no studies have been done in the shrimp marketing channel. Those studies are mostly of descriptive nature, involving no detailed account on the socio-demographic characteristics of the sample such as age structure, religious, educational status etc. the focus has been more on the household status. It is not only essential to know details about the fishery status but the socio-economic status of the community also in-order to implement technological innovation or render government support or intervention for upgrading socio-economic status of the rural people including the poor fishermen.

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9. APPENDICES

9.1 APPENDIX - I: Questionnaire for Gher

Region: ☐ Khulna ☐ Bagerhat ☐ SatkhiraLocation & Subject Information:Vill./Tha: P.O. Upz/Un: Area: Name: Address: Age: Educational & Religious Status:Education: ☐ Illiterate ☐ Primary ☐ SSC ☐ HSC ☐ UniversityReligion: ☐ Muslim ☐ Hindu ☐ OtherManpower, Salary and Funding Status:Workers: Male ☐ Female ☐ Child ☐ Salary (Tk./Day): Male ☐ Female ☐ Child ☐Salary Range (Tk./ Month): Manager / Accountant: Graders: Children / Others: Source of Fund (Ghers): ☐ Self ☐ LoanWater Source & Icing Status:Source of Water: ☐ Gher / Pond ☐ River / Canal ☐ Shallow Tubewell ☐ Deep TubewellIce used after harvesting: ☐ Always ☐ Occasionally ☐ NeverIcing Ratio (Ice: Shrimp): ☐ 0.5 : 1 ☐ 1 : 1 ☐ 1.5 : 1 ☐ 2 : 1Transportation Status to Depot (Directly):Transportation Materials: ☐ Bamboo basket ☐ Plastic Materials ☐ Aluminum / Steel Pot ☐ BagTransportation Carrier: ☐ Van ☐ Hand / Head ☐ Bi-Cycle ☐ Truck / PickupTransportation Route: ☐ Road (Muddy) ☐ Canal ☐ River ☐ Road (Brick/Pitch)Other Information:Grading Spot: ☐ Floor ☐ Tin ☐ Polythene ☐ Wooden PlatformHarvesting Method: ☐ Dewatering ☐ Netting Harvesting Type: ☐ Partial ☐ FullAverage Production (Kg/Day): Pre - Season Season Post - Season Shrimp Quality Status:Handling Period of Shrimp (Hours): ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10

Extremely Good	Very Good	Moderately good	Slightly good	Not good not poor	Slightly poor	Moderately poor	Very poor	Extremely poor
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9.2. APPENDIX - II: Questionnaire for Faria

Region: ☐ Khulna ☐ Bagerhat ☐ SatkhiraLocation & Subject Information:Vill./Tha: P.O. Upz/Un: Area: Name: Address: Age: Educational & Religious Status:Education: ☐ Illiterate ☐ Primary ☐ SSC ☐ HSC ☐ UniversityReligion: ☐ Muslim ☐ Hindu ☐ OtherWater Source & Icing Status:Source of Washing Water: ☐ Gher / Pond ☐ River / Canal ☐ Shallow Tubewell ☐ Deep TubewellIcing Spot (Faria): ☐ Home ☐ Ghers ☐ Depots ☐ OtherIcing Ratio (Ice: Shrimp): ☐ 0.5 : 1 ☐ 1 : 1 ☐ 1.5 : 1 ☐ 2 : 1Transportation Status:Transportation Materials: ☐ Bamboo basket ☐ Plastic Materials ☐ Aluminum / Steel Pot ☐ BagTransportation Carrier: ☐ Van ☐ Hand / Head ☐ Bi-Cycle ☐ Truck / PickupTransportation Route: ☐ Road (Muddy) ☐ Canal ☐ River ☐ Road (Brick/Pitch)Other Information:Grading Spot: ☐ Floor ☐ Tin ☐ Polythene ☐ Wooden PlatformAverage Production (Kg/Day): Pre - Season Season Post - Season Shrimp Quality Status:Handling Period of Shrimp (Hours): ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10

Extremely Good	Very Good	Moderately good	Slightly good	Not good not poor	Slightly poor	Moderately poor	Very poor	Extremely poor
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9.3 APPENDIX - III: Questionnaire for Depot

Region: ☐ Khulna ☐ Bagerhat ☐ SatkhiraLocation & Subject Information:Vill./Tha: P.O. Upz/Un: Area: Name: Address: Age: Educational & Religious Status:Education: ☐ Illiterate ☐ Primary ☐ SSC ☐ HSC ☐ UniversityReligion: ☐ Muslim ☐ Hindu ☐ OtherManpower, Salary and Funding Status:Workers: Male ☐ Female ☐ Child ☐ Salary (Tk./Day): Male ☐ Female ☐ Child ☐Salary Range (Tk./ Month): Manager / Accountant: Graders: Children / Others: Source of Fund : ☐ Self ☐ Loan Ownership : ☐ Self ☐ Rent ☐ Govt.Physical & Structural Status:Size of Depots (Sq. ft.): ☐ 25-50 ☐ 50-100 ☐ 100-150 ☐ 150-200 ☐ 200-250 ☐ 250-300 ☐ >300Floor Structure: ☐ Mud ☐ Plaster ☐ Mosaic ☐ WoodWall Structure: ☐ Bamboo ☐ Wood ☐ Tin ☐ BrickRoof Structure: ☐ Goalpata ☐ Tin ☐ Concrete ☐ OtherWater Source & Icing Status:Source of Washing Water : ☐ Gher / Pond ☐ River / Canal ☐ Shallow Tubewell ☐ Deep TubewellIcing Ratio (Ice: Shrimp) : ☐ 0.5 : 1 ☐ 1 : 1 ☐ 1.5 : 1 ☐ 2 : 1Transportation Status:Transportation Materials: ☐ Bamboo basket & Polythene Sheet ☐ Plastic Materials (baskets) ☐ Plastic DrumsTransportation Carrier: ☐ Cycle Van ☐ Bus/Truck ☐ Bi-Cycle ☐ Pickup VanTransportation Route: ☐ Road (Muddy) ☐ Canal ☐ River ☐ Road (Brick/Pitch)Other Information:Grading Spot: ☐ Floor ☐ Tin ☐ Polythene ☐ Wooden PlatformAverage Production (Kg/Day): Pre - Season Season Post - Season Shrimp Quality Status:Handling Period of Shrimp (Hours): ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10

Extremely Good	Very Good	Moderately good	Slightly good	Not good not poor	Slightly poor	Moderately poor	Very poor	Extremely poor
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9.4. APPENDIX - IV: Questionnaire for Agent

Location & Subject Information:Vill./Tha: P.O. Upz/Un: Area: Name: Address: Age: Educational & Religious Status:Education: ☐ Illiterate ☐ Primary ☐ SSC ☐ HSC ☐ UniversityReligion: ☐ Muslim ☐ Hindu ☐ OtherManpower, Salary and Funding Status:Workers: Male ☐ Female ☐ Child ☐ Salary (Tk./Day): Male ☐ Female ☐ Child ☐Salary Range (Tk./ Month): Manager / Accountant: Graders: Children / Others: Source of Fund : ☐ Self ☐ Loan Ownership: ☐ Self ☐ Rent ☐ Govt.Physical & Structural Status:Area (Sq. ft): ☐ 200 - 300 ☐ 300 - 400 ☐ 400 - 500 ☐ 500 - 600 ☐ > 600Floor Structure: ☐ Mud ☐ Plaster ☐ Mosaic ☐ WoodWall Structure: ☐ Bamboo ☐ Wood ☐ Tin ☐ BrickRoof Structure: ☐ Goalpata ☐ Tin ☐ Concrete ☐ OtherWater Source & Icing Status:Source of Washing Water : ☐ Gher / Pond ☐ River / Canal ☐ Shallow Tubewell ☐ Deep TubewellIcing Ratio (Ice: Shrimp) : ☐ 0.5 : 1 ☐ 1 : 1 ☐ 1.5 : 1 ☐ 2 : 1Transportation Status:Materials: ☐ Bamboo basket ☐ Plastic Materials ☐ Aluminum / Steel Pot ☐ Plastic DrumCarrier: ☐ Van ☐ Bus/Truck ☐ Bi-Cycle ☐ Pickup VanRoute: ☐ Road (Muddy) ☐ Canal ☐ River ☐ Road (Brick/Pitch)Other Information:Grading Spot: ☐ Floor ☐ Tin ☐ Polythene ☐ Wooden PlatformAverage Production (Kg/Day): Pre - Season Season Post - Season Shrimp Quality Status:Handling Period of Shrimp (Hours): ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10

Extremely Good	Very Good	Moderately good	Slightly good	Not good not poor	Slightly poor	Moderately poor	Very poor	Extremely poor
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9.5. APPENDIX - V: Questionnaire for Processing Plant

Location & Subject Information:

Vill./Tha: P.O. Upz/Un: Area:
 Name: Address: Age:

Educational & Religious Status:

Education: ☐ Illiterate ☐ Primary ☐ SSC ☐ HSC ☐ University

Religion: ☐ Muslim ☐ Hindu ☐ Other

Manpower, Salary and Funding Status:

Workers: Male ☐ Female ☐ Child ☐ Salary (Tk./Day): Male ☐ Female ☐ Child ☐

Salary Range (Tk./ Month): Microbiologist / QC: AO: Others:

Source of Fund : ☐ Self ☐ Loan Ownership : ☐ Solely Own ☐ Partnership with other peoples

Water Source & Icing Status:

Source of Water : ☐ Pond ☐ River / Canal ☐ Shallow Tubewell ☐ Deep Tubewell

Icing: ☐ Only Change Ice ☐ Washing & Icing ☐ Only Changing pots ☐ Both Ice & Pots

Icing Ratio (Ice: Shrimp) : ☐ 0.5 : 1 ☐ 1 : 1 ☐ 1.5 : 1 ☐ 2 : 1

Shrimp Quality Status:

Initial Rejection at Receiving Point: ☐ Yes ☐ No Instantly take to QC from RP: ☐ Yes ☐ No Rejected shrimps fate: ☐ Dumping ☐ Return to Agent ☐ Bulk Sale ☐ Other

Problems or prospects of receivers:

Handling Period of Shrimp (Hours): ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10

Extremely Good	Very Good	Moderately good	Slightly good	Not good not poor	Slightly poor	Moderately poor	Very poor	Extremely poor
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9.6. APPENDIX - VI: Organoleptic score sheet for Shrimp

Odour Characteristics	Score	Carapace Color Characteristics	Score
Fresh odour	10	Greenish (Fresh)	10
Sweetly odour	8	Moderately greenish	8
Slightly spoilage odour	7	Slightly greenish	6
Moderately spoilage odour	6	Slightly darken	4
Spoilage odour	5	Moderately darken	2
Slightly off odour	4	Darken	0
Moderately off odour	3		
Off odour	2		
Extremely off odour	0		
Carapace Texture Characteristics	Score	Eye Characteristics	Score
Hard	10	Bright and transparent	10
Slightly soft	7	Slightly dull	7
Moderately soft	5	Moderately dull	4
Soft	3	Dull and Opaque	2
Very Soft	0	Fully dull and opaque	0
Shell Color Characteristics	Score		
Bluish white (no spot)	10		
Slight loss of brightness	7		
Loss of brightness & opaque	5		
Slightly reddish	3		
Radish (spotted)	0		

9.7 APPENDIX – VII: Organoleptic score sheet of overall acceptability for Shrimp

Overall acceptability characteristics	Score Range
Highly Acceptable	8.5 – 10.0
Acceptable	6.5 – 8.0
Moderately Acceptable	4.5 – 6.4
Just Acceptable	3.6 – 4.5
Just Unacceptable	2.6 – 3.5
Unacceptable	1.5 – 2.5
More Unacceptable	0.5 – 1.4