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**Livelihood strategies across socio-economic groups in changing farming systems:  
Insights from salinity prone south-western coastal Bangladesh**

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**Abstract**

In south-western Bangladesh, the combined effects of climatic shocks and stresses, that is, salinity and cyclones, and anthropogenic resource degradation, arising from shift towards brackish water shrimp cultivation, have resulted in a ‘double vulnerability’ context. However, even within the same context, differential resource endowments cause households of different socio-economic categories to adopt different livelihood strategies. This paper uses evidence from two coastal villages to illustrate how households manage their constraints and opportunities to gain optimum livelihood outcomes. In the first village, where protests by local farmers have stopped shrimp farming since 2008, small and medium farmers are trying to diversify their livelihoods through freshwater prawn-fish-crop integration, while some large landowners favouring the quick cash incomes from extensive shrimp cultivation are planning to shift towards intensive methods. In the second village, where decades of dry season shrimp cultivation has forced farmers to replace wet season paddy with white fish, poor farmers are suffering from lack of subsistence crops while richer ones are facing dwindling profits due to deteriorating soil quality.

## 1. A LIVELIHOOD LENS FOR UNDERSTANDING POVERTY AND VULNERABILITY

Bangladesh is recognised as one of the most vulnerable countries to climate change and there is sufficient knowledge to expect that the country will be adversely affected by rising sea-levels, cyclones and storm surges of higher intensities, increasing salinity intrusion, changing river flows and coastal morphology ([Ahmed, 2006](#), [Mohal and Hossain, 2007](#), [Rahman et al., 2007](#), [Karim and Mimura, 2008](#)). However, rural households living in risky environments are mainly concerned with the existing environmental, political and socio-economic challenges that directly affect their lives and livelihoods, and long-term vulnerabilities from climate change are rarely considered separately from these risks ([Pouliotte et al., 2009](#)). Climate change is believed to aggravate the existing anthropogenic stressors, such as changes in resource use systems. This is particularly the case of south-western coastal region of Bangladesh; on one hand, changes in farming system from paddy cultivation to brackish water shrimp farming have significantly increased soil and water salinity, decreased freshwater availability, degraded land quality, reduced livelihood options and decreased food security; on the other hand, the impacts of natural shocks and stresses, such as salinity intrusions, cyclones and tidal surges, are exacerbating these existing socio-ecological challenges. This paper, thus, uses the term ‘double vulnerability’ to express the combined effect of the natural perturbations and stresses and the anthropogenic pressures on socio-ecological systems that people deal with to make a living.

In reality, however, the same vulnerability context can have differential impacts on the well-being of households of different poverty levels. The ability of households to overcome socio-economic constraints, improve livelihoods and ultimately modify their vulnerability context is largely determined by their ownership of assets and livelihood strategies ([Arun et al., 2013](#)). The conceptual linkage between assets, poverty and vulnerability has been developed over the past three decades, especially through Sen’s pioneering work on the ‘theory of entitlement’ ([Sen, 1981](#)) and the ‘capabilities approach’ ([Sen, 1985](#), [Sen, 1993](#), [Sen, 1999](#)) and the subsequent development of the ‘sustainable livelihoods approach’ ([Chambers and Conway, 1992](#), [DFID, 1999](#), [Ellis, 2000](#), [Scoones, 1998](#)). Based on these theories, it can be inferred that wealthier people with higher resource endowments have greater capacity to undertake livelihood strategies with better outcome, compared to poor people whose narrow entitlement sets restrict their choices and reduce their capacity to deal with risks. Thus, in order to unpack the complex linkage between poverty and vulnerability, it is essential to use a ‘livelihoods lens’ that focuses on the assets people have and how they deploy these resources to undertake livelihood activities that govern their overall well-being.

The importance of using a livelihoods perspective in understanding the interactions between vulnerability and poverty has been explicitly highlighted in the recent Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5). The report stated that “*Poverty dynamics are not sufficiently accounted for in current climate change research... Insufficient work assesses the*

*distribution of poverty at the level of households, spatial and temporal shifts, critical thresholds that plunge some transient poor into chronic poverty, and poverty traps, in the context of climatic and non-climatic stressors” (Olsson et al., 2014) (p. 24).* Moreover, although a plethora of studies explore the impacts of climate change on livelihoods, majority of them offer a snapshot of a given situation, but does not address the continuous struggles people face in making a living (Olsson et al., 2014). “*An explicit analysis of livelihood dynamics would more clearly reveal how people respond to a series of climatic stressors and shocks over time” (Olsson et al., 2014) (p. 25).* In Bangladesh, most of the studies related to poverty and climate change have been done in silos, with few attempts to analyse the interactions between the two. These few studies, for example [Brouwer et al. \(2007\)](#) and [Akter and Mallick \(2013\)](#), have employed econometric methods on before and after quantitative data related to a particular extreme event to understand factors differentiating the impacts and recovery of the poor and the non-poor.

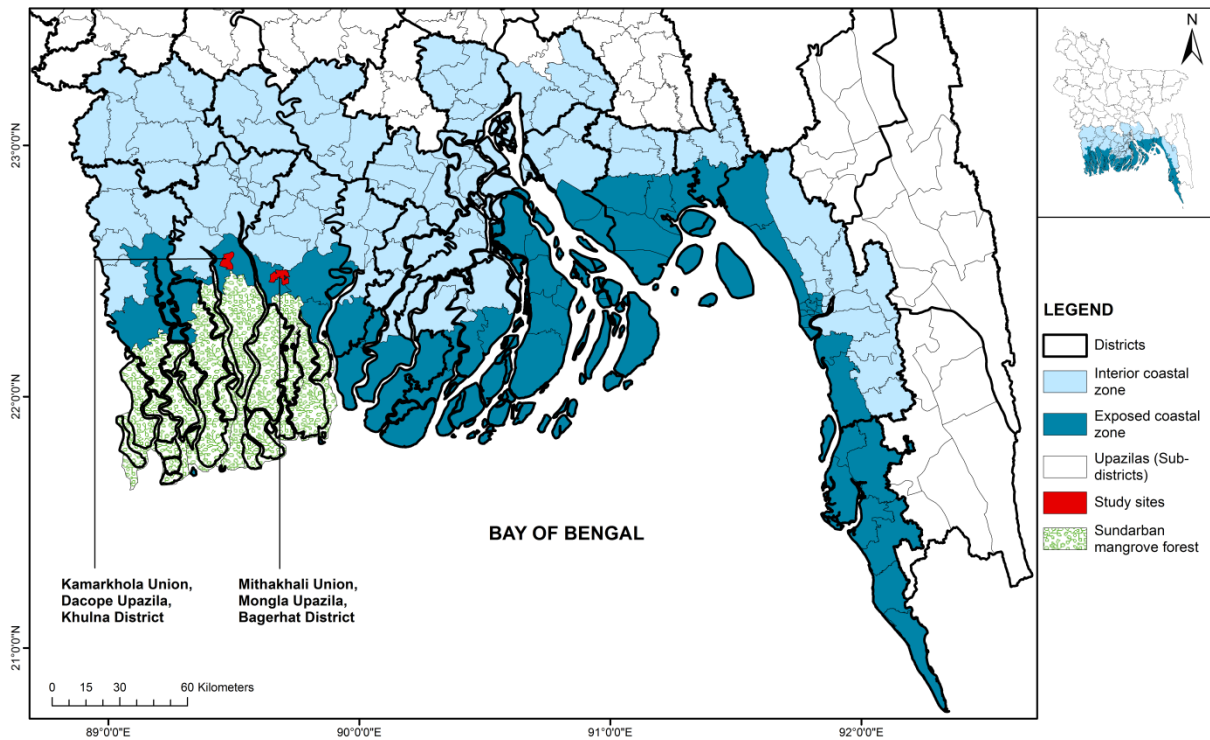
This study aims to address some of the research gaps in analysing the poverty and vulnerability nexus. It employs a livelihood lens to understand how ‘double vulnerability’ arising from natural shocks and stresses and anthropogenic pressures varies according to the socio-economic category of households. It uses rich qualitative data from livelihood trajectories in conjunction with household survey data to extend the realities of people beyond mere numbers. Moreover, instead of focusing on a particular event, such as cyclone Aila, this study addresses the overall vulnerability situation in south-western region where salinity intrusion is a seasonal phenomenon affecting the area every year. Furthermore, rather than dichotomising the society into poor and non-poor, the study population has been disaggregated into five different socio-economic categories that help to disentangle the complex interactions between assets and vulnerability.

The paper is structured in the following way. Section 2 introduces the study sites with respect to their location, natural hazards and changes in farming systems and also briefly outlines the study methods. Section 3 provides a detailed discussion on the livelihood strategies of households of different socio-economic groups, highlighting the changes over time. Section 4 analyses the motivations that determine households’ livelihood decisions and section 5 examines the factors that constrain or support households to pursue their chosen livelihood activity.

## **2. STUDY SITES AND RESEARCH METHODS**

### **2.1 Study sites**

Two villages in south-western coastal region of Bangladesh have been selected for this study. These villages are Kamarkhola village within Kamarkhola union in Dacope upazila (sub-district) in Khulna district and Mithakhali village within Mithakhali union in Mongla upazila in Bagerhat district (Figure 1).



**Figure 1.** Map of Bangladesh showing the two study sites

### *Natural shocks and stresses*

Salinity intrusion, tidal surge and cyclones are the main natural hazards occurring in the south-west coastal area. During monsoon season, the flow of water from upstream rivers pushes the saline sea water southwards, maintaining freshwater in the rivers and canals in the coastal area. In the dry season, when the flow decreases, backwater effect pushes the salinity front further inwards, making the rivers and canals saline. Thus, salinity intrusion is largely a seasonal phenomenon, although it has been exacerbated by the construction of the Farakka dam on the Ganges River in India that has significantly reduced upstream discharge and the establishment of coastal embankments that have increased sedimentation in the tidal rivers. Moreover, climate changed induced sea-level rise is predicted to push the salinity front further inwards ([Mohal and Hossain, 2007](#)).

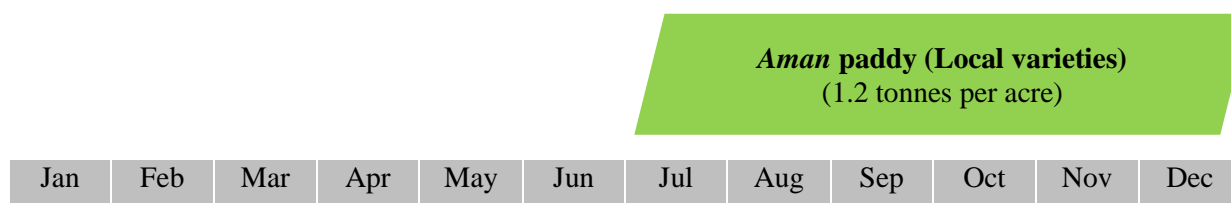
Due to the funnel shaped configuration of the Bangladesh coastline, the region is highly susceptible to tropical cyclones, usually in late May and in early November. Some of the notable recent cyclones are the April 1991 cyclone (wind speed – 225km/hr; casualties – 140,000), the November 2007 cyclone Sidr (wind speed – 223 km/hr; casualties - 3500) and the May 2009 cyclone Aila (wind speed – 92 km/hr; casualties – 200) ([Ministry of Disaster Management and Relief, 2012](#)). Aila had devastating effects on the livelihoods, housing, food security and infrastructure of Kamarkhola union. The tidal surge overtopped the embankment on the western side and in many places, where the embankment had been weakened by illegal gate construction by shrimp farmers, it completely collapsed. Although there were no casualties, most houses were completely destroyed, and everyone took refuge on the embankment on the eastern side for weeks and months. It took almost two years to completely rebuild

the embankment and resume normal livelihoods, leading to extreme hardship among the displaced people. Unlike Kamarkhola, Mithakhali was affected to a lesser extent as it is located towards the inner part of Mongla upazila, a bit far away from the main rivers. The tidal surge which accompanied Aila inundated the village during high tide and the water receded back on the same day during low tide. Hence, apart from the immediate impacts on houses and fisheries, there were no long-term post disaster effects in this area. On the other hand, while the 2007 cyclone Sidr did not affect Kamarkhola union, it had some impacts on Mithakhali union. Although the most devastating impacts were faced by the neighbouring Sharankhola union, the high wind speeds during the cyclone destroyed many poorly built houses and uprooted a number of trees in Mithakhali.

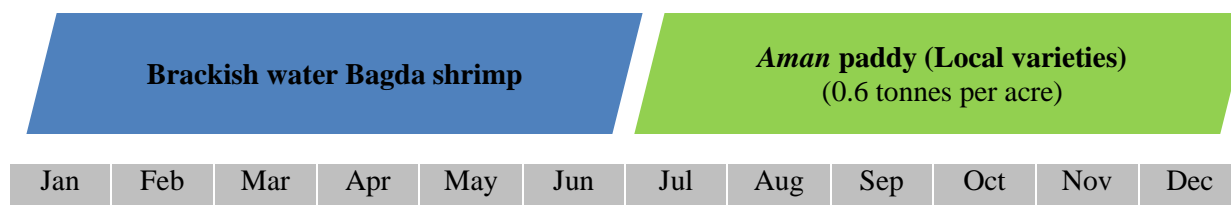
### *Changes in farming systems*

Both the study sites historically depended on cultivation of a single crop (Aman paddy) during the wet season (July – December). Since the late 1980s, export oriented national policies spurred the rapid growth of the shrimp industry, encouraging farmers to use their fallow land for extensive brackish water shrimp (Bagda or Black Tiger Prawn) farming during the dry season (February – June). Subsequently, adverse socio-economic and agro-ecological impacts, such as land grabbing by outside entrepreneurs, increasing economic inequality, conversion of mangrove forests and public land to private shrimp farms, increasing soil and water salinity, destruction of vegetation, decreasing yield of rice and death of livestock, started to become apparent leading to negative perceptions about the industry among communities, NGOs and academics during the 1990s ([Islam, 2008](#), [Karim, 2006](#), [Masum, 2008](#), [Nijera Kori, 1996](#), [Manju, 1996](#), [Paul and Vogl, 2011](#)). In one of the study sites (Kamarkhola), protests by local farmers under the leadership of the local political leader has led to the banning of shrimp cultivation in 2008 and farmers are currently dependent on Aman paddy cultivation together with freshwater prawns and white fish. In the other site (Mithakhali), degradation of soil quality and dwindling of rice yield have forced farmers to stop rice cultivation altogether and replace it with land-based white fish farming during the wet season (Figure 2). The two study sites, with different trajectories in farming systems, serve as important cases in understanding how households' livelihood strategies vary across different socio-economic groups and local contexts.

**Both Kamarkhola and Mithakhali unions:**  
 Before shrimp cultivation started (1980s and before)



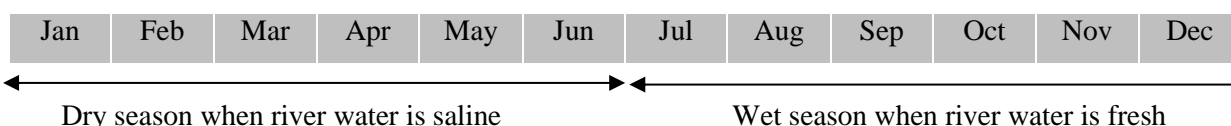
**Kamarkhola union:** Shrimp and paddy cultivation (1990s – 2008)  
**Mithakhali union:** Shrimp and paddy cultivation (1990s – early 2000s)



**Kamarkhola union:** After shrimp cultivation was banned (2009 - present)



**Mithakhali union:** After rice cultivation was stopped (early-2000s to present)



**Figure 2.** Seasonal calendar showing changes in main livelihood activities in Kamarkhola and Mithakhali unions

## 2.2 Study methods

The primary data for this study have been collected in late 2014 using a mixed methods approach, involving both quantitative and qualitative research methods that complemented each other to provide a comprehensive picture of the area of inquiry. Besides the basic village entry exercises such as focus group discussions (FGDs) and key informant interviews, the study used a participatory wealth ranking exercise to disaggregate the households within the community into five different socio-economic groups based on characteristics identified by the respondents. This was followed by a household questionnaire survey comprising of randomly selected 150 households (that is, 25% of approximately 600 households) that gathered information about the household’s demographic profile, ownership of assets and present and past livelihood activities. Finally, about 25 livelihood trajectory interviews

were taken in each site to obtain in-depth information on how an individual's livelihood strategies depend on his/her resources, personal circumstances, local environmental context and broader macro-economic situation.

During data analysis, fuzzy set theory ([Cheli and Lemmi, 1995](#)) has been applied on a total of 17 asset indicators under seven dimensions (education, farmland, homestead and pond area, durable consumptive assets, productive assets, livestock and housing materials) to classify households into five categories (rich, upper middle, lower middle, poor and extreme poor) in each of the study villages. To test the validity of the results, the final fuzzy set membership scores were correlated with the wealth classification obtained from the participatory wealth ranking, and the results from the two different methods yielded high correlation coefficients. The methodological steps and calculations used to categorise the households have not been demonstrated here, as they are beyond the scope of this paper. The qualitative data from livelihood trajectories, FGDs and key informant interviews were analysed using NVivo software.

### **3. LIVELIHOOD STRATEGIES ACROSS SOCIO-ECONOMIC GROUPS**

Rural livelihood portfolios can be highly specialised, being restricted to a couple of activities, or quite diverse, combining a range of farm, off-farm or non-farm activities. The extent of specialisation or diversification is governed by household resource endowments; as rural livelihoods are still heavily dependent on natural resources, livelihood portfolios are determined by ownership and access to natural capital such as land and water bodies ([Scoones, 1998](#)). Thus, socio-economic differences, resulting from difference in ownership of resources, play a major role in the composition of livelihood portfolios ([Scoones, 1998](#)). This section examines the livelihood strategies of households of the five socio-economic groups in the study villages and how these have altered with changes in farming system. Table 1 below shows the numbers of households in each category, their mean productive assets and common livelihood strategies at individual and household level. Figures 3, 4, 5 and 6 present the percentage of households within each category involved in different livelihood activities village for both before and after the transition in farming system.

**Table 1.** Productive assets and common livelihood strategies of households of different socio-economic groups

Study site	Socio-economic category	Number (percentage) of sample households	Productive assets (Average)			Common livelihood strategies at individual level (Adult males only)	Livelihood strategies at household level (current)	Livelihood strategies at household level (before)
			Agricultural land (acres)	Homestead land (acres)	Pond (acres)			
Kamarkhola	Rich	10 (6.7%)	15.54	0.65	0.24	Agriculture – 58% Agriculture & service – 11%	Reluctantly engaged in agriculture or dependent on land rent; planning to move towards semi-intensive shrimp farming	Specialisation in shrimp cultivation, with less focus on paddy
	Upper middle	11 (7.3%)	5.97	0.43	0.21	Agriculture – 64%	Within farm strategic diversification – crops, Galda prawns and white fish	Specialisation in shrimp cultivation, with less focus on paddy
	Lower middle	58 (38.7%)	2.20	0.23	0.12	Agriculture – 49% Service – 11%	Strategic diversification comprising of farm and non-farm activities	Dependent on shrimps; leased out land, had small independent farms, or part of co-operative farms
	Poor	40 (26.7%)	0.58	0.11	0.05	Agriculture – 17% Agriculture & wage labour – 38% Wage labour 12%	Diversification across farm, off-farm and non-farm activities for survival	Dependent on shrimps; leased out land, had small independent farms, or part of co-operative farms
	Extreme poor	31 (20.6%)	0.13	0.07	0.03	Agriculture & wage labour – 14% Wage labour 48%	Depended on physical labour	Depended on physical labour
Mithakhali	Rich	7 (4.7%)	22.53	1.49	0.43	Aquaculture & business – 29% Business – 24% Aquaculture – 12%	Specialisation in shrimp and fish cultivation, with associated businesses	Shrimp and paddy cultivation, with most income generated from shrimp
	Upper middle	18 (12%)	7.36	0.66	0.14	Aquaculture – 63% Service – 16%	Specialisation in shrimp and fish cultivation, with some involved in service	Shrimp and paddy cultivation, with most income generated from



						shrimp	
Lower middle	52 (34.7%)	3.78	0.33	0.98	Aquaculture – 47% Aquaculture & small business – 10% Small business – 10%	Dependent on shrimps and small businesses; lease out land, have small independent farms, or part of co-operative farms	Diversified livelihood comprised of crops, shrimps and white fisheries for subsistence
Poor	50 (33.3%)	1.42	0.29	0.11	Aquaculture – 37% Service – 10% Aquaculture & small business – 8%	Dependent on shrimps; lease out land, have small independent farms, or part of co-operative farms	Diversification across farm, off-farm and non-farm activities for survival
Extreme poor	23 (15.3%)	0.04	0.05	0.03	Wage labour – 40% Small business – 17% Van driver – 10%	Depended on physical labour and petty trades	Depended on physical labour and petty trades

### 3.1 Rich households

Rich households, endowed with large amounts of agricultural land, usually want to specialise in one activity that has high economic returns. In Kamarkhola, during the shrimp cultivation period, most rich households cultivated brackish water shrimps in their own land during the dry season (70%) and grew Aman paddy during the wet season (80%) with a low yield of 0.7 tonnes per acre. About 30% leased out all their land to others for shrimp cultivation, while 10% leased out some land (Figure 3). During shrimp cultivation, these large landowners usually acted as a manager or entrepreneur, taking decisions, supervising accounts, and monitoring hired labour at post-larvae release and shrimp harvesting times. The economies of scale from large amounts of land resulted in more income per unit land and any losses due to disease outbreaks in one of the post-larvae batches can be compensated by releasing another batch. Thus, these households were able to enjoy higher profits with minimum time or labour. After shrimp cultivation has been banned, some rich farmers (60%) leased out most of their land for paddy cultivation while others are reluctantly diversifying their livelihoods by cultivating freshwater prawns cum paddy and rearing livestock like others. Paddy cultivation requires greater investment of time and labour, with relatively lower incomes, making it less appealing for rich. Compared to other socio-economic groups, a larger proportion of rich households (30%) are engaged in the service sector and some activities like wage labour, fishing in open-access canals and sharecropping are almost absent in this group (Figure 4). At an individual level, the two most common livelihood activities of adult male members in these families are agriculture (58%) and agriculture cum service (11%).

Lelin<sup>1</sup> (aged 37), one of the richest farmers in Kamarkhola, mentioned,

*“My father had 66 acres of land, which I inherited after he passed away. I completed my master’s in 2004; if I stayed back in the city I could have earned about BDT<sup>2</sup> 25,000 per month as a service holder. But I chose to return to this village because I believed that the shrimp business had greater prospects. I used to earn BDT 100,000 – 200,000 every month, just by selling the shrimps from my farm. I never worked in the field, but I visited my farm every day to ensure there was no theft. After the ban, I leased out most of my land to sharecroppers. It’s not possible for me to grow paddy in such large amounts of land; I have never done it. I’m thinking of starting a semi-intensive shrimp farm if I can get some loans.”*

In Mithakhali, currently all rich households are engaged in yearlong Bagda shrimp and white fish cultivation as their primary activity. Some of them even lease out a portion of their land to others and earn annual rents. The large land ownership means that not all land is located in the same region; hence, variation exists in terms of soil fertility and topography. Thus, almost half of these households

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<sup>1</sup> Pseudonyms have been used to ensure anonymity and confidentiality of respondents

<sup>2</sup> USD 1 = BDT 80; GBP 1 = BDT 120

(43%) are also able to grow Aman paddy in small portions of their land – a situation which much less common for other classes. However, the yield of paddy is as low as 0.4 tonnes per acre. Large scale Bagda shrimp and fish cultivation is also carried out by some (29%) in homestead ponds, while others only cultivate white fish for consumption. A large number of these households (86%) are also engaged in small or large businesses, mostly related to fish trade, which serves as their secondary income source. Currently, about 63% of rich adult males are involved in aquaculture cum business, aquaculture only or business only. During the 1990s and before, these households cultivated Bagda shrimp during the dry season followed by Aman paddy during the wet season. Pond-based white fish cultivation and homestead gardening were also done by all for household consumption only. Compared to now when none are involved in catching fisheries from canals, about 43% of rich households captured open-access fisheries for consumption in the past.

### **3.2 Upper middle class households**

In Kamarkhola, upper middle class farmers usually pursue within farm diversification. In this case, diversification is often a matter of choice, where the households strategically deploy resources to different activities to obtain optimum returns. Currently, all households carry out crop cultivation in their own land, with 18% households leasing out some of their land to sharecroppers. Given their relatively large ponds, many of these households cultivate white fisheries and Galda prawns at commercial scale (45% and 36%, respectively). While all households also grow vegetables in their homestead gardens, fishing in open-access water bodies is less common, compared to the lower three groups. During shrimp cultivation, about 45% upper middle class households leased out some of their land to others; however, while the poorer groups leased out land due to lack of profits from small parcels or inability to invest, these households leased out land as a form of exchange. On one hand, they leased out small parcels that were located amidst others' lands and on the other land, they leased in land that were situated within their own large parcels. Most of them either had their own big shrimp farms (36%) or were part of a co-operative farm (36%). During this period, these households mainly used their ponds for Bagda shrimp cultivation, with small amounts of white fish for consumption only.

In Mithakhali, most of the upper middle class households (94%) are engaged in yearlong Bagda and white fish cultivation, while households that have their heads involved in service have leased out some or most of their land. The number of service holders is highest in this category, with 39% of households having at least one member involved in service and 19% adult males involved in service cum aquaculture or service only as their as their main occupation. Most households cultivate white fish in their ponds for consumption (72%); while some (28%) do so for sale as well. About 50% households also grow Bagda shrimps in their ponds for sale. During the 1990s and before, these households carried out shrimp farming during the dry season followed by paddy cultivation in the wet

season and also cultivated white fish in their ponds for subsistence. While currently none of these households are involved in capturing open-access fisheries, about 56% used to do so before.

Rezaul Karim Sheikh (aged 50), the head master of a primary school in Mithakhali, said,

*“Till 1995, I have cultivated Aman paddy in the 11 acres of land that I have inherited from my father. At that time, I used to obtain about 0.9 tonnes of rice every season; however, as the yield started to decline due to rising salinity, I started dry season shrimp cultivation like other landowners in the village. Shrimp cultivation was a very profitable livelihood option in the beginning; about 1000 post-larvae used to provide a harvest of 400 kg of shrimp after 3 months. However, continuous waterlogging led to decline in soil fertility, which in turn, resulted in decrease in shrimp productivity. Now out of 1000 post-larvae only 200-300 survive till the harvesting time. For the last couple of years, I have been trying to cultivate some paddy; I leased in 2 acres of land and obtained a total yield of 0.7 tonnes. I also earn a fixed salary from teaching and my overall financial position is much better than most people in the village. However, those who rely solely on shrimp are not in a good financial position.”*

### **3.3 Lower middle class households**

This category comprises of the largest percentage of households in both villages. These households try to make optimum use of these resources; currently all lower middle class households in Kamarkhola engage in Aman paddy production in their own land, three-quarters of them grow white fish for consumption and about one-third even rear Galda prawns at a small scale. Those who have larger ponds also cultivate white fish and Galda prawns at a large scale for sale. Interestingly, 14% of these households are trying out land-based Galda prawns cum white fish cultivation – a farming system that is uncommon in the area. At an individual level, about 49% adult males are exclusively involved in paddy cultivation in their own or leased in land, 11% are service holders and 7% are involved in agriculture cum service. During the shrimp period, about 45% of these households leased out some or all of their land, while others had their own small farm (31%) or were part of a big co-operative farm (19%). Relatively more households were involved in small businesses, as buying and selling post-larvae or mature shrimps were important activities for many.

Yasin Gazi (aged 40), a farmer cum shop owner in Kamarkhola, described his diversified livelihood activities,

*“I have 3.3 acres of land, in two parcels at different locations. In one of the parcels, I cultivate Aman paddy along with freshwater Galda prawns and a variety of white fishes and also plant vegetables, such as brinjals, on the dykes. I use the other land parcel for paddy cultivation only. Fish cultivation requires regular supervision; since that land is quite far away from home, I cannot go there every day. In addition, I have a grocery store at the local market. About four years ago, I borrowed BDT 50,000 from a NGO, which I repaid in ten*

*instalments of BDT 5000 each along with BDT 1000 as interest. During the shrimp cultivation period, I was also involved in Bagda farming for about 10 – 12 years, like other farmers in the village. However, I faced significant losses due to virus outbreaks. I'm very happy that the saline water shrimp cultivation has been banned in this area. Now the environment is much better.”*

In Mithakhali, currently most lower-middle class households (88%) engage in yearlong Bagda shrimp and white fish cultivation, while others have leased out all their land and are solely involved in business or service. Among those who are engaged in aquaculture, 52% have their own small farms, 13% own large farms together with land leased in from others and 21% are part of co-operative farms. Majority of the households use their ponds to cultivate white fish for consumption (77%) and Bagda shrimp at a small scale (50%). Individually, most of the adult men are involved in aquaculture only (47%), while some are engaged in aquaculture cum business (10%) or business only (10%). Before the transition in farming system, most households very involved in Bagda shrimp cultivation followed by Aman paddy (88%), while the rest left their land fallow during the dry season. During that time more households engaged in capturing open-access fisheries (83%) and homestead gardening (96%), mainly for subsistence.

### **3.4 Poor households**

Given the limited asset endowment of poor families, livelihood diversification usually refers to engaging in any available options, even if at a smaller scale. In Kamarkhola, currently as well as during the shrimp period, poor households typically involve in five to six different farm and off-farm activities. About 80% of the poor cultivate paddy in their land during the wet season with an average yield of 1.3 tonnes per acre and about 18% lease in about 0.38 acres for sharecropping. Besides crop cultivation, a major proportion of these households (68%) have at least one adult male member working as a wage labour. For subsistence, most households grow vegetables in their homestead gardens (93%), cultivate white fisheries in own pond and also capture fisheries from open-access water bodies (78%). However, given the small amount of homestead land and pond, the yield is very low. A relatively smaller proportion of households have at least one member involved in service (18%) or small businesses (23%).

During the shrimp period, about a third of these households leased out all or most of their land, while others carried out shrimp cultivation as small independent farms (12.5%), as large co-operative farms (32.5%) or as large independent farms with land leased in from other (2.5%). This shows that since shrimp cultivation is riskier and less profitable in smaller farms, poor households mostly chose to rely on land rent or be part of a larger co-operative farm, rather than doing it independently. About 20% households also worked as wage labours in shrimp farms or bought shrimps from farms and sold them

at the market. At individual level, most adult male members are farmers cum wage labours (36%), while some are only farmers (17%) and some are only wage labours (12%).

Alamgir (aged 44), a poor farmer in Mithakhali, mentioned,

*“Poor people like us have to do a bit of everything to survive. I have leased in 0.66 acres of land, for which I have to pay an annual rent of BDT 10,000. In February-March, I released 21,000 post-larvae in 11 batches at a cost of BDT 600 – 900 per 1,000 post-larvae. But viral attacks killed most of them; I lost my investment and now I don’t know how I’ll pay the rent or repay the loans. In June, I also invested BDT 16,000 to release 111 kg of white fish in my small pond (0.45 acres) for consumption as well as sale; they are my last hope. During December-January, I grow some vegetables in my homestead garden and from April-June, I harvest shrimps from others’ farms. I receive BDT 30 for a kg of brinjals and BDT 50 for every kg of shrimp I harvest.”*

### **3.5 Extreme poor households**

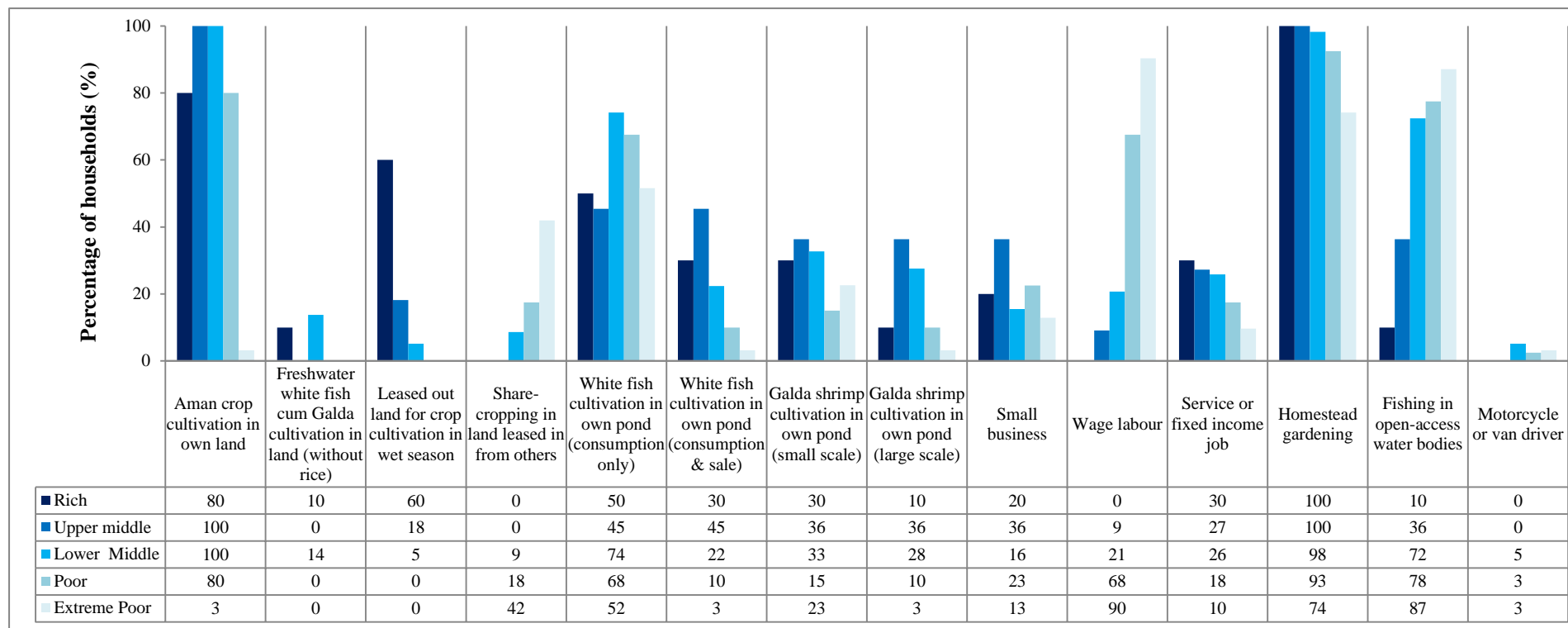
Farm level diversification is limited among the extreme poor as they have no agricultural land, very little space in their homestead area to grow vegetables and very small ponds to cultivate fisheries. In Kamarkhola, the main livelihood activity of this group is wage labouring (90%) followed by sharecropping (42%) and petty businesses (23%). During the shrimp period, the proportion of households involved in homestead gardening and capturing fish from open-access canals was much less due to increased soil salinity and encroachment of canals by private farmers. Moreover, the percentage of households involved in sharecropping was also lower, as better-off households were unwilling to lease out their land and the yield of paddy was also very low. Only 13% households carried out small-scale shrimp cultivation, mostly on leased in land, while most of them worked as wage labour preparing land for shrimp cultivation or harvesting shrimps from farms.

Sufia Gazi (aged 40), a landless housewife in Kamarkhola, narrated the miseries of her family,

*“My husband (aged 50) is the only bread earner; since we never had any land, his only source of income is wage labouring. Depending on work availability, he works on others’ farmland during sowing and harvesting season, cuts mud at government funded local construction work, and loads and unloads goods at the market. His daily income ranges from BDT 50 – 250; many days we have to survive on one small meal only. He cannot even migrate to other districts as we have two disabled members in our family – one is my middle child, who is mentally handicapped and the other is my mother-in-law who is physically paralysed. We cannot even grow vegetables at home as there is no space or rear livestock as we have no paddy husks to feed them. My economic situation has always been the same, but things are better now in certain aspects. Now that the canals are no longer under private control, I can catch fisheries for subsistence. I can also collect cow dung from the grazing lands for cooking*

*fuel. Moreover, after Aila, a NGO built a nice house for us, which is much better than the one that has been destroyed.”*

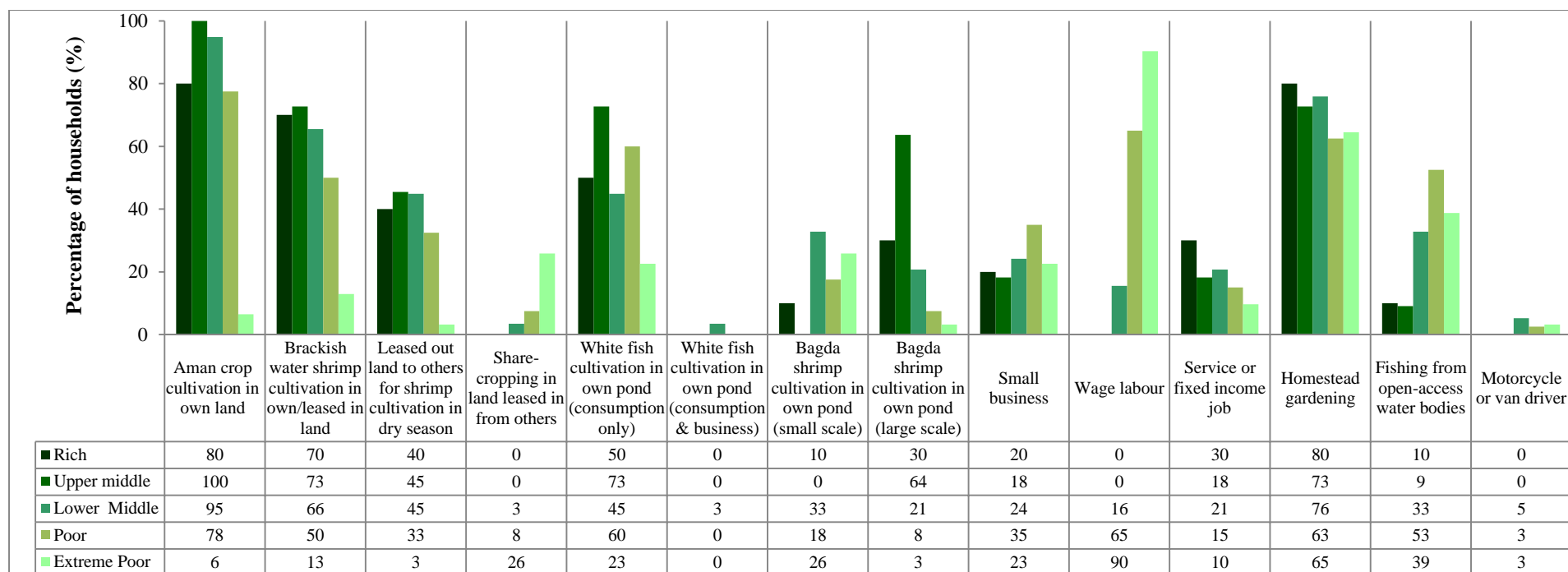
Extreme poor households in Mithakhali also combine off-farm income as wage labour (78%) and non-farm income from petty businesses (39%) to make a living. The proportion of households involved in small businesses is highest for this class; business for these households usually involve buying shrimp from farms and selling them for a marginal profit, trading shrimp post-larvae or owning a small tea/grocery shop. Only 13% of households with agricultural land between 17-40 decimals have their own small shrimp farms, 21% are engaged in buying and selling shrimps, 9% are involved as managers, security guards or wage labours in farms and a majority of 56% are not involved with shrimp cultivation in any way. Since pond ownership is very limited (with 74% having between 2-5 decimals and 17% having no ponds), these households mainly use their ponds for cultivating small amounts of fish for subsistence. Livelihood strategies for these households were quite similar before as well; however, more households were involved in capturing open-access fisheries (91% compared to 61%) and homestead gardening (30% compared to 17%). Slightly greater numbers of people were also involved as wage labours because many worked in the shipyard at Mongla port during that time.



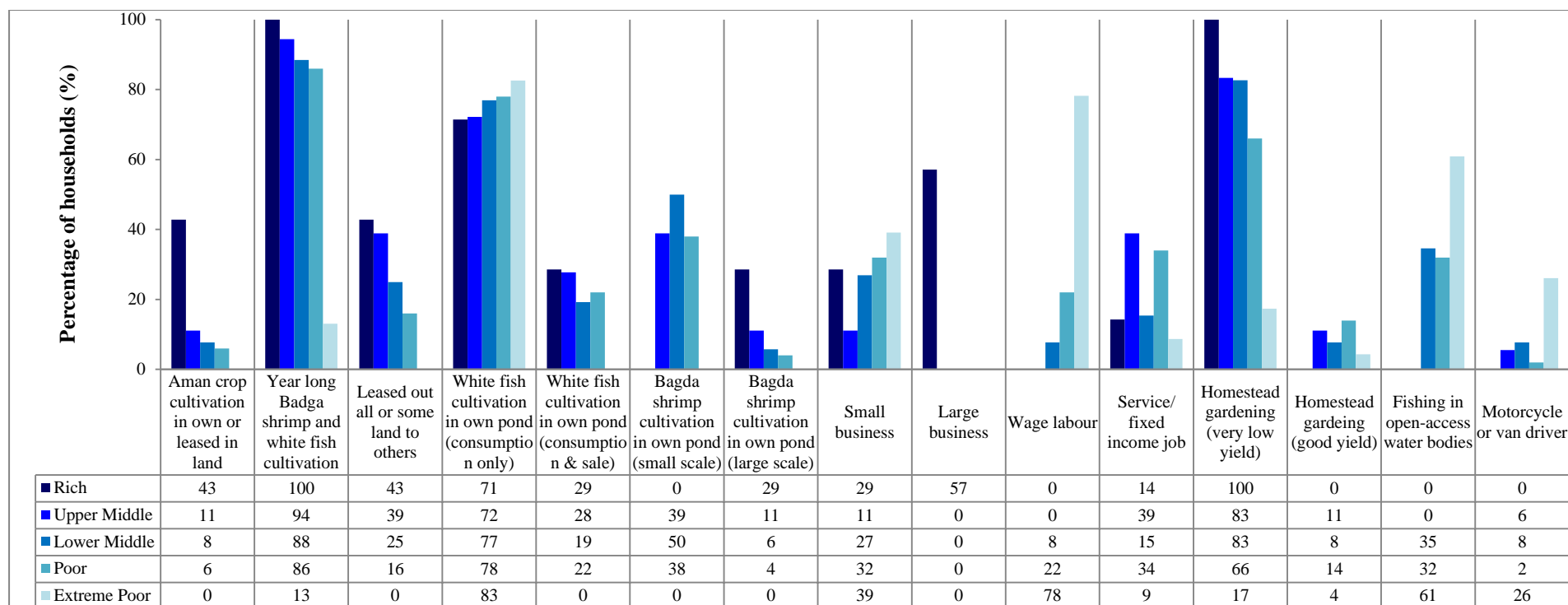
**Figure 3.** Livelihood activities of households across socio-economic groups in Kamarkhola after shrimp cultivation was banned (2009 – present)<sup>3</sup>

<sup>3</sup> Numbers represent the percentage of households in each socio-economic group that mentioned being involved in the given activity

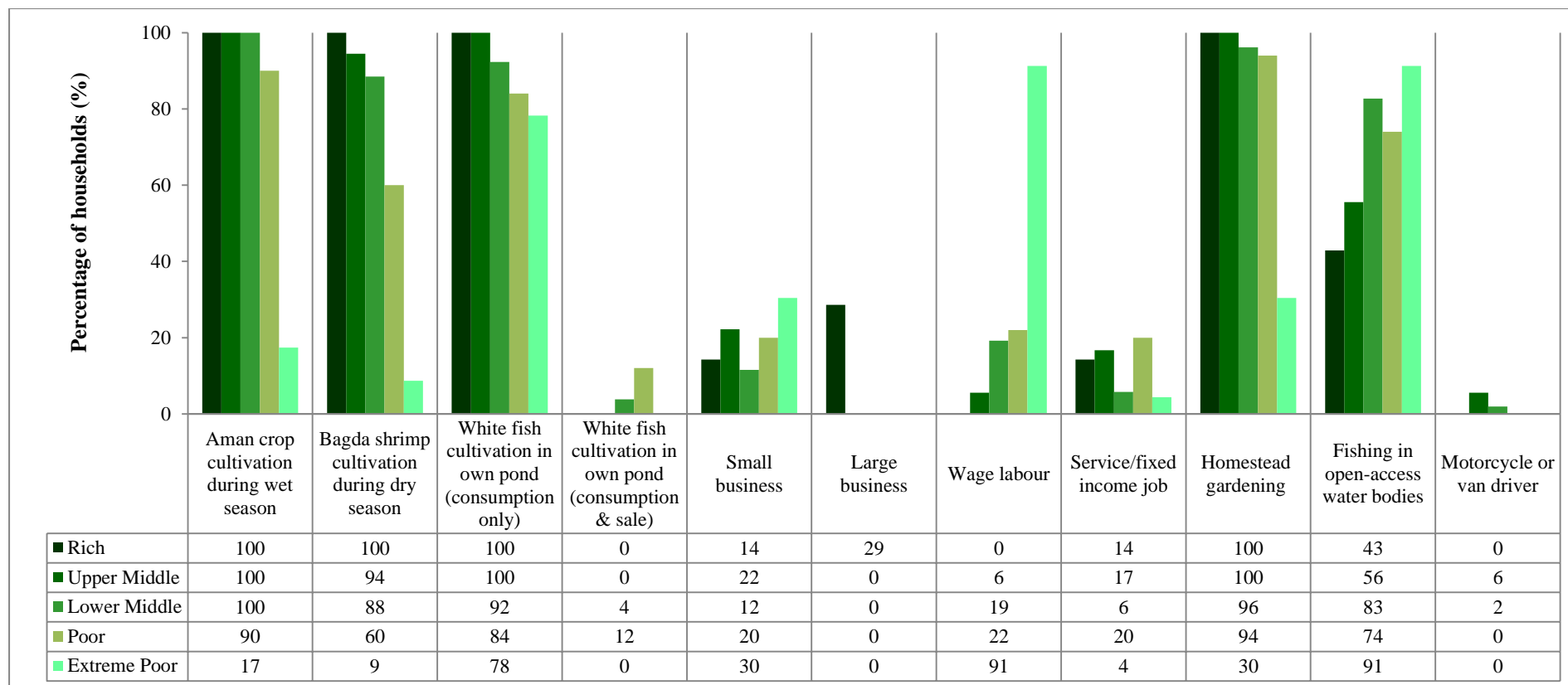




**Figure 4.** Livelihood activities of households across socio-economic groups in Kamarkhola during shrimp cultivation (mid 1990s - 2008)



**Figure 5.** Livelihood activities of households across socio-economic groups in Mithakhali (early 2000s - present)



**Figure 6.** Livelihood activities of households across socio-economic groups in Mithakhali (1990s – early 2000s)

#### **4. MOTIVATIONS FOR DIFFERENT LIVELIHOOD STRATEGIES**

The livelihood activities adopted by households of different socio-economic categories have been discussed in the previous section. This section presents an analysis of the various reasons that persuade people to choose these strategies. People have different perceptions of what constitutes a good life which determines their overall preference for shrimp farming or paddy cultivation in the first place. However, since views differ, certain groups of people in both villages are forced to follow the farming system against their will. Yet, within the constraints of the given farming system and individual resource endowments, people try to design their livelihood portfolios in ways that reduce risks of hazards and diseases, smoothen consumption through seasonal variation in income, take advantage of complementarities between different activities and generate optimum returns from their factors of production.

##### **4.1 Perceptions of wellbeing**

Although brackish water shrimp cultivation is usually much more profitable than paddy farming, about 81% households in Kamarkhola and 60% in Mithakhali are against shrimp farming. There are a number of reasons for this perception. Firstly, rural households prefer the subsistence oriented livelihood comprised of planting crops, rearing livestock and cultivating fish for consumption. This livelihood system has been handed down for generations; consequently, people have more experience in crop cultivation than shrimp farming that has been introduced by outsiders since 1990s. Secondly, shrimp cultivation is unsustainable and highly detrimental to the local environment. Large-scale shrimp cultivation increases soil and water salinity, which adversely affects crop production, homestead gardening, freshwater fish cultivation and livestock rearing. It reduces freshwater availability for drinking and domestic purposes, increases breeding ground for pathogens and worsens air quality due to lack of vegetation. Thirdly, and most importantly, people are against shrimp cultivation because of the precarious nature of the yields and economic benefits. Virus attacks are a major concern and the extent of disease outbreaks has increased shrimp mortality to upto 80% in the last half decade. Although absolute losses are higher for large farmers, they can cope with previous savings and greater investments in next season. However, losses for poor farmers lead to food insecurity for the entire year and increasing debts.

A limited number of people – about 13% in Mithakhali and 9% in Kamarkhola - support shrimp cultivation. These people can be divided into three groups based on their rationale for favouring shrimp cultivation. The first and largest group comprises of people who have always earned good profits and whose economic well-being has improved significantly due to shrimp cultivation. The second group consists of people who are not shrimp farmers themselves but whose businesses are directly related to shrimps. These people either sell post-larvae to farmers or purchase harvested

shrimps from them. The third group of people are usually involved in non-farm activities such as service or other trade and have leased out their land to shrimp farmers. Since land rent is higher in shrimp farming villages, these people enjoy the steady incomes from rent even if the farmers face losses in particular years.

#### **4.2 Risk reduction**

Although risk reduction is considered as an important push factor for livelihood diversification ([Barrett et al., 2001](#)), households rarely mentioned *ex ante* risk reduction as their motivating factor. This is because the main risk factor in these areas is increasing salinity in the dry season, which is *not* an unanticipated event. People have lived in this salinity regime for decades and are aware of the seasonal nature of salinity intrusion. Another risk factor is cyclone accompanied with tidal surge; although cyclones are totally unexpected, households do not include it as a factor in diversifying farm activities because in case of cyclones, such as Aila in 2009, everything is washed away regardless of the type of crop, fisheries or livestock.

A few households mentioned avoidance of risks associated with shrimp diseases as a motivation for leasing out land for a fixed rent instead of directly engaging in the farming process. In some cases, although diversification towards off-farm and non-farm activities certainly reduced risks, the primary motivation was not risk reduction. For example, in case of the upper middle class farmer mentioned in section 3.2, his fixed salary from teaching helps to maintain household income in years of low shrimp yield; however, his involvement in teaching is a result of his education, rather than a risk reduction strategy.

In Kamarkhola, diversification was used as an *ex post* coping strategy following cyclone Aila. In this case, livelihood diversification was an unplanned and involuntary response to disaster, which was mostly adopted by poor and extreme poor households. For example, in the immediate aftermath of the cyclone, when all private farms and gates were destroyed, poor people used nets to catch tonnes of fisheries that came along the tidal water every night. Later they also engaged in cash for work programmes, such as rebuilding the embankment.

#### **4.3 Seasonality**

As most households in rural areas are engaged in farm and off-farm agricultural activities, seasonality is an inherent characteristic of their livelihoods. Diversification can be an optimal strategy when some factors of production such as land or labour remain under-utilised due to seasonal or market variations ([Paavola, 2008](#)). Households have to meet their continuous consumption needs even when income flows diminish. While drawing on savings or selling stored crops is a widespread means of dealing with income instability, temporary migration to other agricultural zones is a common strategy to smoothen consumption. Between December and February, male members of poor households in both

villages go to nearby Fakirhat upazila or Gopalganj district, where availability of freshwater enables cultivation of dry season Boro crops and farmers hire additional labour to work in their fields.

#### **4.4 Economies of scope**

Complementarities between the different activities often results in diversification within the farm. Poor farmers with low levels of capital often find it easier to add more activities associated with the primary livelihood option, rather than investing in new or non-farm areas ([Hussein and Nelson, 1998](#)). [Barrett et al. \(2001\)](#) terms it as ‘economies of scope’ which allows greater per-unit incomes when the same inputs are distributed across multiple outputs instead of a single one. For example, in Kamarkhola, now that farmers have shifted from shrimp to paddy, it is possible to rear livestock as the cow dung provides manure for the crops and the hays serve as fodder for the animals. Another example is the integration of paddy, freshwater Galda prawns and white fish in agricultural fields, as exhibited by the lower middle class farmer in section 3.3.

Economies of scope can also be achieved when one engages in a business directly related to his farm products or starts farming products that are bought and sold as part of the business. For example, Tariqul Islam, a crab businessman cum farmer in Mithakhali, was initially a trader who bought crabs from other farmers and sold them to depots in Khulna. Crabs are not intentionally farmed in Mithakhali, rather they are a by-product of shrimp cultivation. However, when Tariqul realised the potential profits from crabs, he started his own crab farm in 1.33 acres of land, making him the first crab farmer in the area. Now he has also developed connections with crab juvenile collectors; besides buying by-product crabs from other farmers, he has also started supplying crab juveniles to them, so that they can intentionally grow crabs in their farms. The crabs from his own and others’ farms have in turn increased the sales of his business.

#### **4.5 Optimum returns from factors of production**

In the past, rural households in Kamarkhola had a subsistence oriented livelihood comprised of a single paddy crop, large numbers of livestock and fishes for consumption. However, with the same or even lesser amount of productive assets, today’s households adopt a more market-oriented livelihood to generate cash. People with sufficient pond areas and capacity for investment intensify their fish cultivation for sale and even carry out polyculture with freshwater Galda prawns. Fisheries are also integrated with crops and vegetables in agricultural land, to provide subsistence as well as cash income. These forms of strategic diversification cum intensification result in optimum use of resources and help to maintain or enhance economic well-being.

There are also examples of people who lease out some or all of their land to make time for non-farm activities such as business or services. For example, Bilal Ahmed, one of the few university graduates in Kamarkhola, has been teaching at a primary school and privately tutoring students for the last 12 years. Although he owns 5 acres of agricultural land he does not have time to farm them by himself.

Hence, he leased out 3 acres for an annual rent of BDT 45,000 and another 2 acres on a sharecropping agreement. He also has two ponds where he cultivates Galda prawns and white fish for sale. Besides, a large portion of land within his homestead area is used for growing seasonal vegetables. This diversified livelihood strategy provides him subsistence, cash income and also allows him to use his educational skills.

In Mithakhali, dwindling profits from shrimp cultivation, due to diseases and poor soil fertility, is a major concern for all households and farmers are trying to cope by intensifying the cultivation process. According to an experienced farmer, the mortality rate has increased from 5% to as much as 80%; hence, compared to 15 years ago when farmers would release four batches of 1500-2000 post-larvae per acre and obtain an yield of about 170 kg after five months, now they have to release upto six batches of 2500-3000 post-larvae and yet get half the yield. Moreover, to generate more incomes from their resources, some farmers are trying to restart crop cultivation and homestead vegetable gardening wherever some high land parcels are available. Some are even experimenting with freshwater Galda prawn cultivation, although it is not the norm in this village.

## **5. FACTORS AFFECTING LIVELIHOOD OUTCOMES**

While section 4 presented the various motivations behind adopting different livelihood strategies, this section examines the factors the constraint or support households in pursuing their chosen activities. A number of environmental factors such soil quality, economic factors such as presence of labour/land markets and increased demand for farm produce, political factors such as local power play, institutional factors such as access to credit and relief, and personal assets such as land and education, significantly affect the livelihood outcomes.

### **5.1 Soil quality**

Soil fertility is one of the most important factors in determining the yield of crops as well as the productivity of shrimps which depend on natural phytoplanktons for food. In Mithakhali decades of shrimp cultivation has deteriorated the soil quality to such an extent that farmers had to stop paddy cultivation completely and replace it with white fish farming. In recent years, the soil has been depleted of its nutrients and is becoming unsuitable for supporting shrimps as well. Farmers now have to add fertilisers, artificial fish feed and greater numbers of post-larvae to cope with the dwindling yields.

In Kamarkhola, following the ban on shrimp cultivation, the soil quality has increased substantially over the past five years. However, continuous inundation of land for months after Aila has affected individual land parcels differently. While some farmers have benefitted from silt deposition, others have suffered from layers of sand deposited by tidal waters. Rafiqul Islam, a rich farmer, complained that the top layer of his land is covered with at least one foot of sand, which has decreased rice yield

and increased input costs for fertilisers and pesticides. Contrarily, Abdul Jalil, an upper middle class farmer, explained that due to deposition of silt and clay, the paddy yield was as high as 2.2 tonnes per acre during the first couple of years after Aila. He further explained that this type of high yield was possible during the 1970s-80s, when large numbers of livestock were allowed to graze on the fallow land during the dry season, causing deposition of dung. But nowadays, due to scarcity of fuelwood, women collect all the dung from the grazing land for cooking fuel, thus, depriving the land of natural fertilisers.

## **5.2 Control by powerful farmers**

Shrimp cultivation has always been an avenue for power play. Although the initial era of land grabbing and control by outside entrepreneurs is a thing of the past, large local shrimp farmers still influence the system in certain aspects. Despite majority of the farmers being against shrimp cultivation, they do not have the power to stop it unless the large landowners and powerful members are willing to do so. Individual small farmers cannot cultivate freshwater paddy unless adjacent large landowners stop flooding their lands with saline water. Even when all farmers are cultivating shrimps, small landowners are usually depended on larger ones for water exchange. A poor farmer in Mithakhali alleged that during heavy rains large farmers intentionally do not drain their lands, so that water from large farms flow to the smaller ones causing the shrimps from the smaller farms to escape to the larger ones.

There are also allegations that powerful farmers in Mithakhali are lobbying with the local political party members to prevent the construction of an embankment in the area, as the embankment would prevent entry of saline water during the dry season. Most farmers believe that, like other areas, the embankment will allow crop based livelihoods to prosper in this area. Large farmers also block canals and bring them under private control, which significantly reduces the amount of natural fisheries and prohibits poor people from capturing them for subsistence. Even in Kamarkhola, where shrimp cultivation has been banned, a couple of large farmers are using their political contacts to illegally cultivate shrimps in some of their land. Lelin, a rich farmer, mentioned that he uses his affiliation with the ruling political party to secretly release saline water into some of his land to cultivate shrimps. However, the yield is lower, because previously the whole land would be flushed at a time, but now water has to be released slowly from underground aquifers and holes in the embankment.

## **5.3 Market demand and proximity to physical markets**

National and international market demand drives the capacity to diversify livelihoods and explore new options. The livelihood trajectories revealed examples of how some households are trying to explore newer products to take advantage of different markets. In Kamarkhola, a teenager studying in secondary school mentioned that he earned about BDT 20,000 in the previous year by selling pigeons that he rears at home. Although he initially started rearing birds as a childhood hobby, the increased



demand for pigeons as pets and delicacies in urban areas provided him an opportunity to turn his hobby into a livelihood option. Similarly, in Mithakhali, a small number of shrimp farmers have also started to grow crabs due to their increased demand in big hotels in the capital city as well as in European markets.

Proximity and easy access to local business hubs facilitate the growth of non-farm activities. This is the case for Mithakhali village which is very close to Mongla business town and sea port and has good transportation facilities. Thus, 24% of the adult males in Mithakhali are exclusively involved in business and 23% are farmers cum businessmen. In contrast, in Kamarkhola, only 5% adult males are engaged in business and 12% are involved in agriculture cum business. Most of the businesses in Mithakhali are related to the shrimp and fish supply chain. Moreover, given the cash based economy and the peri-urban characteristics of Mithakhali, households have to purchase most of their daily necessities, leading to establishment of many grocery shops in the area.

#### **5.4 Presence of land and labour markets**

[Barrett et al. \(2001\)](#) argues that incomplete land and labour markets often prohibit skilled individuals from investing their time in activities in which they have comparative advantage and force them to diversify their farm level activities to make a living. If land and labour markets are operative, individuals might rent out their land and indulge in other activities that will bring higher returns ([Barrett et al., 2001](#)). The latter scenario has been observed in Mithakhali, where both the selling price and the rent of land have increased manifolds in the last two decades due to high demand for land for extensive shrimp cultivation. Unlike the shrimp period in Kamarkhola, where land was rented for only half the year at BDT 9000 per acre, in Mithakhali, the current rent is BDT 15,000 per acre as the land is leased for the entire year for shrimp and white fish cultivation. Thus, some land owners with good education have leased out all their land and are working in the service or business sector where they have comparative advantage. Many poorer farmers with small land parcels have also leased out their land to large farmers and are themselves engaged in wage labouring activities. Labour markets are well established in the area and people can migrate to nearby rice farming areas and shipyards to work as day labours. Informal social networks allow flow of information on work availability.

#### **5.5 Availability of credit**

Rural farming systems are largely based on credit either from formal organisations such as banks and NGOs or from relatives or fellow farmers/traders. Access to credit is even more important when venturing into a new activity, such as starting freshwater aquaculture or establishing a small shop. During 2013-14, 65% of the 150 surveyed households in Kamarkhola have taken loans from NGOs (39%), banks (19%) or relatives (6%) for a number of purposes such as for investment in crop production (14%), investment in fish cultivation (9%), education of children (12%), starting new business (5%) and others. The percentage of households having taken loans in the previous year is

significantly lower in Mithakhali, where only 18% of the sample households have taken loans mainly for investment in fisheries (11%) and businesses (3%).

There are a few reasons why more households are taking loans in Kamarkhola compared to those in Mithakhali. Firstly, in Kamarkhola, households are venturing into new activities after shrimp cultivation has been banned in 2008 and have resumed normal livelihood activities in 2011 after recovering from the 2009 cyclone Aila. New activities, especially Galda prawn farming, require high initial investment. For example, Taposh Mondol, a lower middle class farmer in Kamarkhola, mentioned that he borrowed BDT 160,000 from various NGOs to re-excavate his pond and start freshwater Galda prawn and white fish cultivation in 2013. Secondly, crop cultivation is more reliant on a system of borrowing and repaying. They borrow at multiple stages for land preparation, purchase of inputs, hiring labour, sowing seeds, irrigation and harvesting. They also repay these loans at different times after they sell their crops. Thirdly, following Aila, activities of NGOs and donor organisations have significantly increased in Kamarkhola and people have easier access to credit from these development organisations.

Moreover, credit is not only restricted to borrowing money. Businesses and farmers purchase raw materials from other traders on credit. The most common practice is taking post-larvae from fry collectors or sellers and repaying them after selling the harvested shrimps. Shrimp farmers also do not get the price of their shrimps immediately. They sell these to middle men or depots who in turn send these to processing plants in Khulna. This entire system of credit within the supply chain is based on mutual trust.

## **5.6 Institutional support**

Apart from credit, NGOs also provide support in the form of relief and rehabilitation. In Kamarkhola, during the first couple of years after Aila, most households, regardless of socio-economic category, exclusively depended on support from the government and NGOs for survival and rehabilitation. Of the 150 survey households, 55% mentioned that they received food aid from various organisations in the immediate aftermath of the cyclone. Within the first year following the cyclone, almost all households (92%) received BDT 20,000 in cash from the government for re-constructing houses and those who did not receive cash, had their houses built by NGOs (16%). About 9% households received Vulnerable Group Feeding cards, which provided them 30 kg of rice per month. In post-cyclone period, that is, from 2012 till date, a number of NGOs have been helping the extreme poor people in Kamarkhola to diversify their livelihoods.

However, a number of middle class and rich households complained that these organisations are biased towards the extreme poor, making them dependent. Their main complaint is that the poor households didn't have many assets to lose in the first place; it was the better-off households that lost their fisheries, livestock, trees and houses and their absolute losses were much greater. Moreover, in

the immediate aftermath of the cyclone, the better-off households found it embarrassing to stand in queues with the poor for relief materials. During this time, while the poor households could grab any livelihood opportunity such as capturing fish or cutting mud, the better-off had to draw on savings as they considered such activities to be socially demeaning.

### **5.7 Experience and knowledge sharing**

Learning from others and following those who have been successful in a given activity are important factors that help rural farmers to explore new livelihoods and properly manage existing ones. During the initial era of shrimp cultivation, local farmers had very little knowledge about the farming system; hence, after the exodus of outside entrepreneurs, when locals started shrimp farming in their own land, they often failed to earn profits in the initial years. Oliar Rahman, an upper middle class farmer in Kamarkhola, stated that when he first started shrimp cultivation in 8 acres of land in 1994, he suffered from huge losses. Later, by observing his neighbouring farmer he learned that releasing back small shrimps that get caught in the net during harvesting ultimately cause them to die rather than getting bigger in size. This knowledge helped him to earn higher profits the next season.

Today, people in Kamarkhola have little experience in pond-based freshwater Galda prawn farming, as they have been mainly involved in land-based brackish water Bagda shrimp cultivation until 2008. Taposh Mondol, the lower middle class farmer mentioned in section 5.5, added that he didn't earn any profits in the first season because of his lack of experience. He gets advice from his contacts in another prawn farming area, where farmers earn as much as BDT 300,000 per season. He commented that depending on his success, other farmers in Kamarkhola are willing to start their own farms in future. Similarly, based on success stories of others, many rich and upper middle class farmers in Mithakhali are planning to start semi-intensive shrimp cultivation. Compared to the extensive method, where less than 25,000 post-larvae are stocked per hectare, in semi-intensive farming up to 200,000 post-larvae can be cultivated per hectare. Hence, in semi-intensive farms, the initial investment is as high as BDT 2 million per hectare and the yield is about 5-6 tonnes per hectare; whereas in extensive farms an investment of BDT 100,000 can yield only 300 kg of shrimp per hectare ([Parves, 2014](#)).

### **5.8 Ownership of land**

Both in agriculture and aquaculture based livelihood systems, quantity of land owned is the key factor in determining the scale of farm activities, the amount of profits and also the socio-economic status of the household. Ownership of land per household has significantly declined primarily due to division of land among children. The household survey data shows that in the last two decades, 40% of the households in Mithakhali have lost a median of 4 acres and an average of 4.8 acres of land due to division of inherited property. Similar statistics are observed for Kamarkhola as well.

Some people also sold off their land to meet household necessities and gather money for investment in other ventures. The outcomes of liquidating assets can be different. For example, one farmer cum

businessman in Mithakhali, mentioned that his father sold around 45 acres of land to educate him and his siblings, which has enabled them to move to non-farm activities with steady income. On the other hand, Rafiqul Islam, a lower middle class farmer, described how his family circumstances and poor fate led to a decline in his wellbeing. Firstly, his family had to sell about 9 acres of land to cope with the financial crisis after the untimely death of his father. Secondly, he sold another 6 acres to cope with the losses from shrimp farming and to start a rice mill in Khulna, which also turned out to be a loss project.

A number of people, especially in Mithakhali, have used their profits from shrimp cultivation or other businesses to purchase land during the 1990s and early 2000s. Hence, these people were able to increase their land ownership and improve their socio-economic status in the long run. Of the 150 sample households in Mithakhali, 45 households (30%) have purchased land in the last three decades, although the quantity varies significantly from 0.66 - 38 acres, with a median of 1.32 acres. If disaggregated by socio-economic status, 5 of the 7 rich households (71%), 8 of the 18 upper middle class households (44%), 19 of the 52 lower middle class households (37%) and 12 of the 50 poor households (24%) have purchased agricultural land. Thus, many of the better-off households are in their current socio-economic situation because of land accumulation at a time when price of land was much lower.

The percentage of households that have bought land and the amount of land purchased are significantly less in Kamarkhola. In the last three decades, only 17% of the survey households have purchased between 0.08 – 1 acre of land, with a median value of 0.66 acres. Of the 25 households that have purchased land, 13 belong to the lower middle class and 9 belong to the upper middle or rich class. The market demand for land is comparatively lower in Kamarkhola because this area has been dependent on shrimps for a relatively shorter period of time and even during the shrimp cultivation period, aquaculture was carried out for only half of the year. Hence, as the value of outputs generated from land was lower, people had less money and willingness to purchase more land.

## **5.9 Improved education**

The literacy level in rural Bangladesh has significantly risen in the last one and half decade, mainly due to increased awareness, availability of schools in every village and state provision of free primary education for all and free secondary education for girls. This is revealed by our household survey data in the study sites, where younger adults have higher education levels than older ones. In Kamarkhola, 69% of the people aged between 19 and 25 have Secondary School Certificate (SSC) degree or above, while for those aged between 26 and 40, between 41 and 55, and 56 and above, the percentages are 36%, 25% and 11% respectively. Similar statistics have been found in Mithakhali as well, where 67% of the people aged between 19 and 25 have at least passed SSC degree, compared to 32% people aged between 26 and 40, 19% between 41 and 55, and 9% aged 56 and above. The increase in education

has allowed the newer generation to move towards non-farm activities at a time when division of land among siblings through generations has significantly reduced the land ownership of each household.

## **6. CONCLUSION**

The objective of this paper is to analyse how ‘double vulnerability’ arising from natural shocks and stresses and anthropogenic pressures vary among households of different socio-economic categories. A livelihood perspective has been used to understand how households with differential resource endowments and varied perceptions of wellbeing adopt different livelihood strategies to make a living. Livelihood trajectory interviews and household survey data from two coastal villages that have undergone different changes in farming systems have been used to illustrate the complex relationship between poverty and local vulnerability context. The following paragraphs summarize the main findings of this paper.

Salinity intrusion is a seasonal phenomenon, which has always precluded dry season paddy cultivation in the south-western coastal region of Bangladesh. However, the soil and water salinity have increased significantly in the last two to three decades due to brackish water shrimp cultivation. Shrimp cultivation using low input extensive method is highly profitable; however, over time degrading soil quality and increasing disease outbreaks have increased shrimp mortality to such an extent that most farmers are facing dwindling profits. In Mithakhali, during the last decade, decline in soil fertility compelled farmers to phase out wet season paddy and replace it with land-based white fish farming. On the other hand, in Kamarkhola, these adverse impacts have spurred widespread protests causing shrimp cultivation to be banned. Coincidentally, cyclone Aila affected the area at the same time, destroying any remaining shrimp farms.

These changes in farming systems have had differential impacts on households of different socio-economic categories. Rich households with large amounts of agricultural land typically prefer to specialise in shrimp cultivation, which brings in large incomes with minimum effort. Many of these rich households reside in towns outside the village and require cash incomes to live a peri-urban lifestyle and properly educate their children so that the next generation can move towards non-farm activities. The upper middle class households also tend to specialise in one activity as their main income source, but at the same time they try to generate optimum returns from their resources by carrying out large scale white fish, shrimp or prawn farming in their ponds and homestead gardening when possible. The lower middle class households do not have enough land to specialise in one activity; besides diversifying their farm outputs, they also try to engage in non-farm activities such as service or small businesses. Diversification is also seen among the poor households who try to grab any available opportunity for survival and usually combine their small-scale crop or shrimp cultivation with wage labouring. In Mithakhali, the poor and lower middle class are the worst affected households because they can neither earn enough cash from small-scale shrimp cultivation or land

rent nor can they grow crops for subsistence. Similarly, in Kamarkhola, while middle income households have resources to invest in new livelihood activities, poor people suffer from land, pond and cash deprivation which often prevent them from starting prawn or fish farming on a commercial scale. Finally, in both sites, the extreme poor households, who have never directly been involved in farming, have to depend on physical labour to make ends meet.

The study also found that regardless of the current farming system, vast majority of the people in both villages are strongly against shrimp cultivation as it is economically unsustainable, increases salinity level, degrades the environment, and constrains people's freedom to choose their preferred livelihood option. Shrimp cultivation often gives power to large farmers who usually control the water exchange, encroach into public canals, and often lobby with the local government to prevent any actions that might affect their farms. On the other hand, these farms provide some employment opportunities for the poorer people who are involved in different parts of the supply chain. In Mithakhali, the agro-ecosystem has almost reached a tipping point and most people agree that if they wish to revert to the previous farming system, they would have to suffer from extreme hardship for couple of years.

Within the constraints of the given farming system and individual resource endowments, people have diverse motivations for choosing particular livelihood strategies and these decisions and outcomes are influenced by number of environmental, socio-economic, institutional and personal factors. Households try to reduce their risks of losses from shrimps by leasing out land or engaging in fixed income jobs; they try to smoothen their income fluctuation by temporary migration during the lean season; they seek to take advantage of complementarities between different activities; and design a livelihood portfolio that meets both their cash and subsistence needs. The study found that although involvement in non-farm activities, especially fixed income jobs and businesses, insure households against natural shocks and stresses; agriculture or aquaculture still serves as the main source of income for majority of households, and hence, land ownership is the most important factor is determining the socio-economic status and well-being of the household. Land is the starting point for generating others forms of assets, such as education, which often allows people to move towards non-farm activities and reduce their dependency on natural resources. Even non-farm activities such as businesses are often directly or indirectly related to farm activities and the scale of the activity and the proportion of income generated from it are also quite small.

Institutional support, such as relief and rehabilitation materials, is essential in case of rapid onset disasters, and support in the form of low interest credit is helpful for communities in transition where people are venturing into new livelihood activities. There is a general reluctance among people to take loans from NGOs, as the interest rates are quite high; although bank loans are more preferable, they are not accessible to the poor who do not have enough assets to show as security. The role of NGOs in providing livelihood trainings and information support is still quite limited. In the context of rapidly changing resource use systems and environmental conditions, local knowledge needs to be

supplemented by expert trainings. For example, currently, while most people in Kamarkhola are trying to diversify their livelihoods through Galda prawn farming, they do not have any experience in this activity and are solely relying on experimentation. If these endeavours were supported by trainings and knowledge dissemination by the government or NGOs, the livelihood outcomes would be much better.

Overall this study has observed that rural people are mainly concerned about the factors that affect their livelihoods in the present and near future and climate change comprises a small fraction of the risk portfolio. [Pouliotte et al. \(2009\)](#) had similar findings; unless explicitly probed, rural households rarely mention climate change as a risk factor, although they are quite aware due to the rigorous activities of NGOs and donor organisations. The bottom line is that while risks associated with climate change pose a real threat to exposed populations, adaptations cannot be considered in isolation. The main focus should be on developing sustainable livelihood options for rural people that will generate incomes as well as prevent degradation of the natural resources.

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