

# MARKET DEVELOPMENT FOR DISASTER RISK REDUCTION: GALACHIPA VALUE CHAIN ANALYSIS



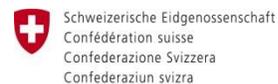
Value Chain Analysis:  
Galachipa Upazila, Patuakhali District

Action for Enterprise

*Submitted to:*

Swiss Agency for Development and Cooperation (SDC)

Dhaka, Bangladesh



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## EXECUTIVE SUMMARY

Bangladesh is one of the most disaster prone countries in the world regularly suffering from a number of natural hazards. Most disaster responses in the country have followed traditional patterns of relief aid designed without taking market systems into account, and consequently often lead to a culture of dependency amongst the beneficiaries and create market distortions as the markets are flooded with subsidies. Rather than providing distortionary relief “aid,” a better approach would be to rehabilitate affected markets and help households reintegrate into these markets and enter into new markets. Relief agencies worldwide are making the transition to more market-oriented approaches in their relief and rehabilitation activities. Many development practitioners and donors have recognized that disaster response efforts need to have economic components in order to facilitate the transition from relief to development. Incorporating market-oriented approaches into disaster risk reduction (DRR) efforts should improve the effectiveness of relief and recovery operations.

The study conducted by Action for Enterprise (AFE) focuses on how improving the efficacy of market-oriented approaches into relief efforts can be accomplished by introducing market-oriented approaches into disaster risk reduction (DRR) efforts. The objective of the study is to utilize this methodology in order to increase benefits for the poor and the ‘most vulnerable’ through 1) increased sustainability of economic gains, 2) reduced vulnerability from natural hazards, and 3) improved targeting of relief efforts in the event of disasters.

Galachipa Upazila, situated in Patuakhali District, was selected as a target area for this study to pilot this approach, because it is particularly prone to natural hazards such as cyclones, tidal surges, high winds, and erratic rainfall, as well as due to the presence of on-going DRR projects and the local Disaster Management Committee. The study conducted in Galachipa consisted of the selection and mapping of economic and recovery market systems with an explicit focus on the vulnerability of these systems to specific hazards. Economic markets consist of economic value chains, specifically economically productive value chains within which the poor are active as producers, consumers, and employees. Recovery market systems consist of recovery value chains, those which have economic benefits, but are crucial value chains in relief and reconstruction efforts such as rebuilding housing, addressing food scarcity, and accessing safe drinking water.

The selection of economic and recovery value chains were based on a cursory analysis of vulnerability to hazards for various market systems in the Galachipa area. The final two economic chains, *chili* and *pond fisheries*, and the final three recovery value chains, *corrugated galvanized iron (CGI) sheets*, *chira (dry food)*, and *tube wells* were selected based on relevancy of the needs of inhabitants during hazards, as well as on the higher ranking they scored against the selection criteria used in the ranking grid. The mapping process of these value chains generated knowledge that is useful in improving the targeting and efficiency of any future disaster relief efforts to rehabilitate the market system in Galachipa. Furthermore, the process produced a series of recommendations and potential facilitation activities for DRR programming aimed at reducing the vulnerability of the market systems from natural hazards.

## 1. INTRODUCTION OF METHODOLOGY

The purpose of this report is to present the findings of the study carried out by Action for Enterprise (AFE) with the objective of improving the efficacy of market-oriented approaches into relief efforts by introducing market-oriented approaches into disaster risk reduction (DRR) efforts. Our approach is to analyze the selected economic and recovery value chains from input suppliers to end users, and the relationship among them. Potential market-based solutions are identified, which generate potential facilitation activities that can contribute to DRR efforts by addressing major constraints and opportunities identified during the analysis. Recommended market based-DRR interventions address specific challenges faced by market actors during disasters.

The selected value chains consist of *chili* and *pond fisheries*, as economic value chains, and *corrugated galvanized iron (CGI) sheets*, *chira (dry food)*, and *tube wells* as recovery value chains. The analysis focuses on how the repercussions of Galachipa’s regional hazards directly impact the economic and recovery value chains. The study team conducted an in depth analysis, carried out through interviews and focus group discussions with market actors and supporting NGO and governmental agencies, to gain a greater understanding of the factors influencing industry performance, vulnerability, market trends, and the level and quality of support services

The following sections present the descriptions and findings with regard to each respective economic and recovery value chain entailing, the rationale for selection, an assessment of end markets and competitiveness, the repercussions from hazards, an exploration of seasonality issues, a value chain map and description of market actors, constraints due to the vulnerability, market based solutions to address each specific constraint, and recommended market based-DRR facilitation activities.

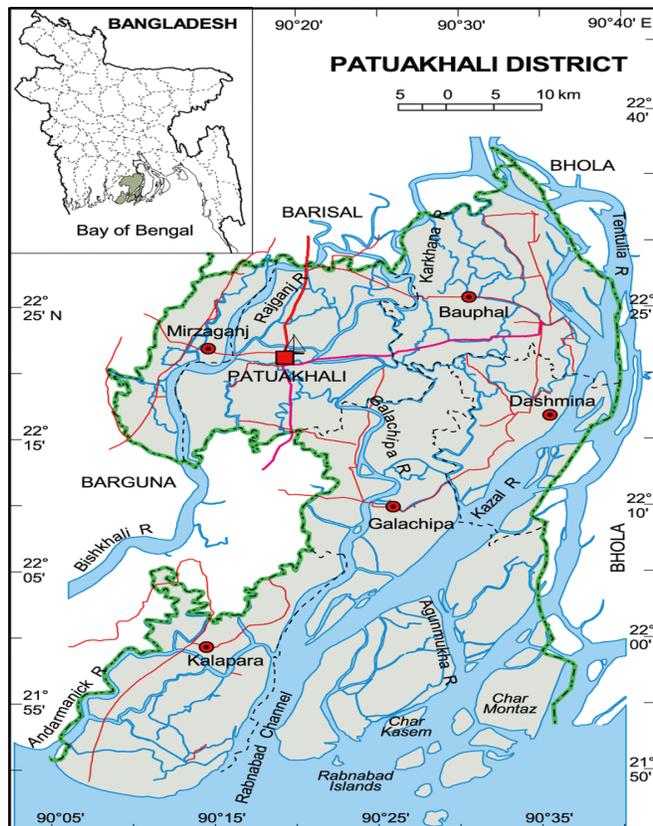
## 2. HAZARDS AND VULNERABILITIES

### 2.1 Galachipa Hazards: Cyclones, Tidal Surges, and Erratic Rainfall

Situated in Patuakhali District in the southern end of Bangladesh, Galachipa Upazila measures an area of approximately 1,268 square miles, and is home to an estimated 286,307 inhabitants.<sup>1</sup> Due to its location it is particularly prone to natural hazards. Galachipa is located on the southern coast, bordering the Bay of Bengal, and is low lying and unprotected from the sea, making its risk factors from natural disasters untenable.

The nearly triangular shape of the Bay of Bengal has its apex along its northern shoreline and reaches the full coast of Bangladesh. In times of severe tropical storms, namely cyclones,

1 Map of Galachipa Upazila in Patuakhali District



<sup>1</sup> Bangladedpedia

the shape of the bay funnels the storm surge pushed by the cyclones on to the coast of Bangladesh. The shape is accentuated by the shallow waters which allow for the build-up of high storm surges. The devastation caused by these surges can be especially destructive and deadly when they occur at high tide.<sup>2</sup> Patuakhali District and the surrounding southern coastal regions are particularly low lying where the elevation of the land does not exceed 33-50 ft above sea level in height.<sup>3</sup> Therefore, natural hazards such as cyclones, tidal surges, high winds, as well as erratic rainfall are reoccurring threats in Galachipa in April before monsoon season, and from October to mid-December, post monsoon season.

With regard to cyclones, devastation is typically produced by storm surges, and most destruction results from the tidal surge. High winds and torrential rains that strike also produce significant destruction,<sup>4</sup> as well as water logging which occurs as a result of tidal surges and lasts up to 20 days post disaster. The intensity of the storm reportedly lasts for approximately five to six hours and subsequently the seawater recedes back to the Bay of Bengal. However, due to the low lying nature of the land, portions of land become submerged in flood waters and water logging occurs.<sup>5</sup>

Accounts of deadly cyclones striking the region stretch back over four centuries. The earliest on record struck the Bakerganj (presently Barisal) and Patuakhali regions, reportedly killing 200,000 people in 1582.<sup>6</sup> Another notable disaster occurred on November 12, 1970. A devastating tidal surge accompanied by a cyclone claimed the lives of over 100,000 people in Patuakhali District alone,<sup>7</sup> and the detriments of the devastation remain lucid in the Galachipa inhabitants' minds, 42 years later, as those who endured the disaster recounted details of the tragedy to the study team.<sup>8</sup> In more recent years, super cyclones Sidr and Aila hit Patuakhali District and its surrounding coastal areas on November 15, 2007 and on May 25, 2009 respectively, causing vast destruction and claiming many lives in the district.



### **Cyclone Sidr**

Cyclone Sidr hit the southwestern coast of Bangladesh on November 15, 2007, causing severe destruction and flooding throughout the region. The Government of Bangladesh identified twelve districts most affected by the cyclone and went on to classify four districts (within the twelve) as 'worst' affected. Patuakhali and its neighboring district Barguna fall within this category with the third highest death toll reported in Patuakhali (457 mortalities) and with severe damages to water and sanitation, housing, embankments, and agricultural activities.<sup>9</sup> The figures below

<sup>2</sup> [www.islandnet.com](http://www.islandnet.com)

<sup>3</sup> [www.islandnet.com/~see/weather/events/sigcyclonebangladesh.htm](http://www.islandnet.com/~see/weather/events/sigcyclonebangladesh.htm)

<sup>4</sup> <http://environment.nationalgeographic.com/environment/natural-disasters/hurricane-profile/>

<sup>5</sup> Interview with DRRO

<sup>6</sup> [www.islandnet.com/~see/weather/events/sigcyclonebangladesh.htm](http://www.islandnet.com/~see/weather/events/sigcyclonebangladesh.htm)

<sup>7</sup> Daily Star

<sup>8</sup> Interview in Galachipa Mainland

<sup>9</sup> Super Cyclone Sidr 2007, Impacts and Strategies for Interventions, Ministry of Food and Disaster Management, Bangladesh Secretariat, Dhaka

highlight the extent of damage found in Patuakhali following the disaster reemphasising the vulnerability of the district to reoccurring hazards.

Figure 1: Damages and Loss caused by cyclone Sidr 2007 in Patuakhali and neighbouring districts<sup>10</sup>

Damages and Losses caused by Cyclone Sidr 2007 in Patuakhali and Neighboring Districts					
	Patuakhali	Barguna	Barisal	Bhola	Jhalokathi
Number of embankments fully damaged	82.8 km	168 km	8.4 km	15.4 km	**
Number of embankments partially damaged	582 km	437 km	134.5 km	107 km	**
Number of tube wells damaged	2250	1200	900	800	1900
Number of ponds damaged	**	500	**	**	100
Number of houses partially damaged	130,000	90,000	90,000	20,000	70,000
Number of houses fully damaged	50,000	90,000	40,000	18,000	65,000
Number of agricultural crops fully damaged	18,000 hectares	15,000 hectares	10,000 hectares	2,000 hectares	5,000 hectares
Number of Agricultural crops partially damaged	190,000 hectares	115,000 hectares	120,000 hectares	170,000 hectares	42,000 hectares

\*\* No figures available.

### Cyclone Aila

Similarly, Cyclone Aila hit the southwestern coast of Bangladesh on May 25, 2009, and the impact from torrential rains and high winds resulted in some fatalities and many displaced people. Various villages were either completely submerged in floodwaters or destroyed. Specifically in Patuakhali, an embankment broke and submerged five villages. Consequently, numerous homes in Patuakhali District were destroyed by the subsequent flooding, and tens of thousands of people were left stranded in the villages.<sup>11</sup> The map depicted in **Figure 2**, provides findings from the effects of Aila, and the impact of the cyclone on Patuakhali District. The map is based on an analysis from MODIS (or Moderate Resolution Imaging Spectroradiometer) Satellite Imagery and was produced by the World Food Program (WFP), suggesting that 781,926 people were affected in Patuakhali District, and of those, 176,794 people were affected in Galachipa. On the map, the red shading signifies the surface water post cyclone Aila, suggesting that the southern region of Galachipa's mainland was submerged. However, the majority of the mainland was not severely affected. Comparatively, the *char* Bara Baisdia, located in Galachipa

<sup>10</sup> Source: Super Cyclone Sidr 2007, Impacts and Strategies for Interventions, Ministry of Food and Disaster Management, Bangladesh Secretariat, Dhaka

<sup>11</sup> Wikipedia

Upazila south of the mainland, was severely affected, particularly the western coastline which was completely submerged in saline floodwaters.<sup>12</sup>

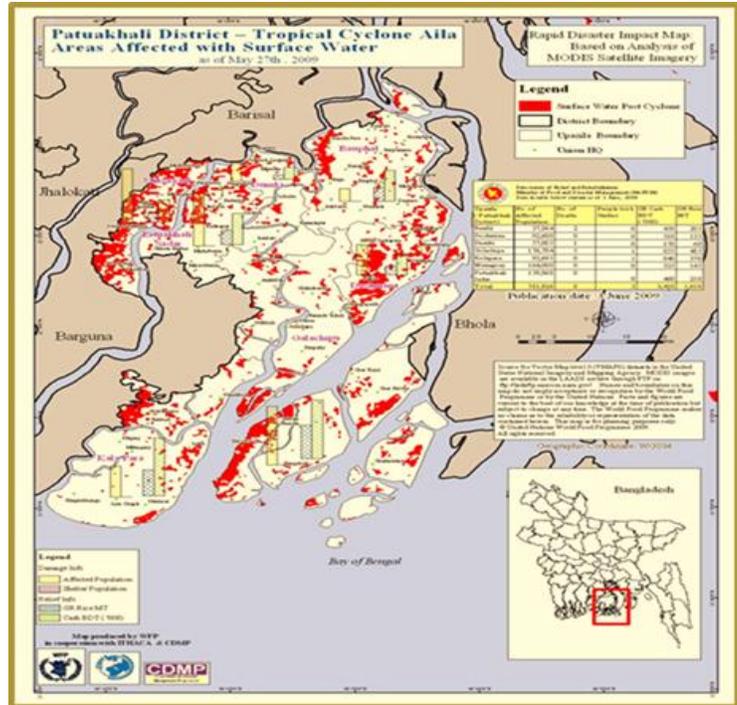
## 2.2 Galachipa Vulnerabilities due to Hazards

Due to the sudden onset of the tidal surge from the cyclone, Galachipa inhabitants do not have sufficient time to collect assets and make arrangements for their homesteads. Rather, when the cyclone hits and is visible within eyeshot, the coastal belt inhabitants are solely focused on a 'reactive approach' seeking shelter in either established shelters, or on embankments to save their own lives. Loss of life and destruction to homesteads, crops and livestock are typical and grave, depending on the severity of the storm. Farmers in Galachipa are struggling with increased salinity caused by tidal surges, sea-level rises, and erosion of the coastline.

In the aftermath of these severe calamities the majority of the population lose their assets and homes with their homesteads usually damaged beyond repair. The following factors illustrate and highlight specific vulnerabilities due to hazards in Galachipa.

**District Relief and Rehabilitation Forewarning System:** The District Relief and Rehabilitation Office has an effective forewarning system in place, which alerts people in times of natural hazards through signaling and information dissemination by means of microphones from mosques, encouraging people to prepare for the impending storm and seek shelter. Prior to the cyclone, monitoring of storm speed and movement takes precedence, and preparation for rehabilitation measures ensue. Post cyclone, information pertinent to rescue and rehabilitation is collected by the local union, which is transferred to the upazila administration, then to the district level, and then to the central level. Depending on needs, actions are taken and coordinated by the local and central levels.

However, despite the effective warning system in place there are instances when the system fails, mainly because warnings are disregarded by the population for varying reasons, and major destruction follows due to lack of preparedness. Due to the nature of the cyclone prone region, Patuakhali District inhabitants are frequently subjected to numerous governmental storm signal warnings. This is because the DRRO is required to send warnings to inhabitants and have them seek shelter when the signal reaches a range of 7-8, an indication for a potentially destructive storm. The signal warning system is particularly effective in times when inhabitants adhere to warnings. However, a majority of times, these signals are mere 'false alarms' and do not result in destruction. Therefore, due to the frequency of the signals and 'false alarms', inhabitants of Galachipa reported that they often disregard the signal and take a reactive approach, seeking shelter once they see the storm coming. Due to high speeds and the vicious nature of the cyclone



2 Patuakhali District- Tropical Cyclone Aila Areas Affected with Surface Water as of May 27, 2009

<sup>12</sup> <http://www.ithacaweb.org/maps/bangladesh/>

storm, measures taken at this point may be too late, and can result in significant loss of life as was the case with Sidr. The District Relief and Rehabilitation Officer (DRRO) of Patuakhali reported that Sidr was particularly destructive because signals and warnings were disseminated from the DRRO indicating that the storm would hit earlier in the day. However, Sidr reached the coastline in the evening, and since people disregarded alerts and put down their guards, they were unprepared and highly vulnerable when the storm surprisingly hit later than anticipated.<sup>13</sup>

**Selection of Beneficiaries for Relief:** Post cyclone, support in the form of rehabilitation and relief are provided by the local and central government, as well as by local and international NGOs. However, there is often a lack of coordination between these entities and those in need get overlooked, while other beneficiaries receive multiple layers of support.<sup>14</sup> Inhabitants in Paan Poti expressed their frustration, noting that the beneficiary selection process for governmental relief support is skewed and “not just.” Reiterating the notion that local unions and community leaders are involved in the selection process of beneficiaries, local inhabitants insist that instead of selecting the “most vulnerable” to receive support, unions and community leaders favor those individuals who support elected officials.

Loss of land and homes due to cyclones is forcing people to move and rebuild their homes, and as a result,



3 Remote Areas are Accessed by Water Ways

extensive relief items were distributed post cyclones Aila and Sidr. These resources are invaluable for the inhabitants of Galachipa. However, the flipside is that too much relief can make people dependent. Furthermore, since relief is distributed to individuals, people can start to view each other as competitors rather than as facing common problems that need to be addressed through cooperation, not competition. Such was the case in Paan Poti, when community members started to complain that other community members were manipulating the relief system and receiving “too many” services.

It was also reported that remote areas are particularly vulnerable because of the inherent dangers involved in accessing them by water ways post disaster. Therefore, inhabitants living in particularly remote areas are likely to be neglected for up to one week after a storm, without access to food, clean water or aid.<sup>15</sup> Whereas inhabitants residing in more secure areas are likely to receive multiple layers of relief efforts.<sup>16</sup>

**Health Hazards:** Subsequent rehabilitation actions taken after a severe storm include rescue operations, supplying dry food and grains, clean drinking water, housing support and medical treatment. Following the impact of a cyclone, the health of inhabitants is often tenuous. For instance, post Aila, the Bangladeshi Health Organization confirmed a widespread outbreak of diarrhea, and increase in waterborne diseases.<sup>17</sup> These health hazards are exacerbated by the lack of clean drinking water. Post cyclone,

<sup>13</sup> DRRO

<sup>14</sup> Interview with Bader Hat, Goalkhali Union and DRRO

<sup>15</sup> Red Cross

<sup>16</sup> Disaster Risk Reduction Officer

<sup>17</sup> Red Cross

saline water inundates tube wells, as was the case with Cyclone Aila, as well as ponds which are used for cooking and cleaning.

**Cyclone Shelters:** Furthermore, a large number of people in coastal Patuakhali District are highly vulnerable because cyclone shelters are scarce and can accommodate only 700,000 of the 17,000,000 people.<sup>18</sup> In Ratandi Taltoli Union specifically, it was reported by the Union Parisaad that there were only 4 cyclone shelters with a maximum capacity of 2,000 people, which is inadequate as there are 20,000 people living in the area.<sup>19</sup>



4 Cyclone Shelter

During cyclones, since defenseless inhabitants are in survival mode, competition to seek refuge in a storm shelter is extremely intense. The frantic scene during a cyclone was described as chaotic, where inhabitants “run for their lives” and “fall down” in an attempt to reach shelter or embankment while children, the elderly and sick individuals are often neglected. Many do not even attempt to seek refuge in a shelter as they know there is inadequate space available, and do not want to abandon their assets in their homesteads, and therefore, they observe variances in the sea, and when severity of wave action increases they seek refuge on the embankments.

**Soil Degradation:** People living in the coastal area of Galachipa are suffering from cyclones, and tidal surges. Besides the obvious threat to people’s safety, these hazards are also severely affecting livelihoods. Saltwater inundation is increasing the salinity of the soil and damaging crops, causing severe losses for the farmers. As a result of the cyclone and thereby water logging, soil degradation of fallow land has increasingly become a challenge, with soil salinity and sand carpeting attributed as the two main causes for land degradation. This in turn has had an adverse effect on farming activity as the majority of the population have limited knowledge of and access to appropriate irrigation techniques to overcome salinity issues. Furthermore, waterlogging can damage an entire crop.

Whilst areas further inland are less susceptible to salinity, they unfortunately also have less access to irrigation facilities. Areas closer to the coast (such as Augunmukh which opens on to the Bay of Bengal) is where the water is at its most saline and farmers that have access to irrigation facilities rely on “sweet water” or lower saline water stored earlier in the year, whilst most others are not able to grow crops during this time. As a result of high salinity throughout much of the Upazila, and the lack of access to irrigation for most farmers, the range and volume of potential crops for cultivation is quite limited, and most farmers sell their production at the local market and do not venture into Galachipa town.

<sup>18</sup> Daily star

<sup>19</sup> Interview with Union Parisaad

### 3. ECONOMIC VALUE CHAIN ANALYSES

#### 4. CHILI

##### 4.1 Rationale for selection of Chili

Despite the fact that chili is grown in smaller volumes in Galachipa, especially in comparison to Kazipur (the other target area for this pilot study), it remains one of the most important cash crops for farmers as the majority of farmers cultivate chili. Chili is prevalent throughout Galachipa and therefore is vulnerable to extreme natural disasters such as cyclones, tidal surges, flooding and heavy rainfall. Because chili is ubiquitous in Galachipa, and a relatively profitable crop, disruptions in chili cultivation directly undermine the economic security of chili growers.

##### 4.2 End Markets and Competitiveness

In Galachipa, one crop of chili is produced throughout the year post rice harvest, and the vast majority of chili production is small scale, consisting of less than one acre. Production costs for the local varieties range from 200-250 Tk per decimal and for hybrid varieties from 350-400 Tk per decimal.<sup>20</sup>

There is a high demand for chili in both the local and national market. However, in spite of the high demand for chili, production is relatively low mainly due to fallow land and high contents of salinity in the soil. Typically, chili grown in Galachipa is produced for home consumption, and for the domestic market, and is sold at local or neighboring markets. However, a significant portion of chili is also consistently sold to the Dhaka market. The number of traders involved in sales to Dhaka is dependent on seasonality and the demand for chili. Large sized traders purchase chili from growers and small traders, and sell to wholesalers at the Dhaka market biweekly. Means of transportation to access the Dhaka and neighboring markets are readily available and consistent, at a transportation cost of 3 Tk/kg of chili. Fortunately, natural hazards do not completely disrupt the transportation of chili, and in times of disaster, the supply of chili to local and national markets resumes within 2-7 days. The sales price for chili is volatile and dependent on the quality and demand of the markets, but ranges from 80 Tk/kg for ripe chili and 20 Tk/kg for green chili.



5 Small Scale Trader in Galachipa's Central Market

<sup>20</sup> Interview with Farmer



6 Hybrid Chili Seeds

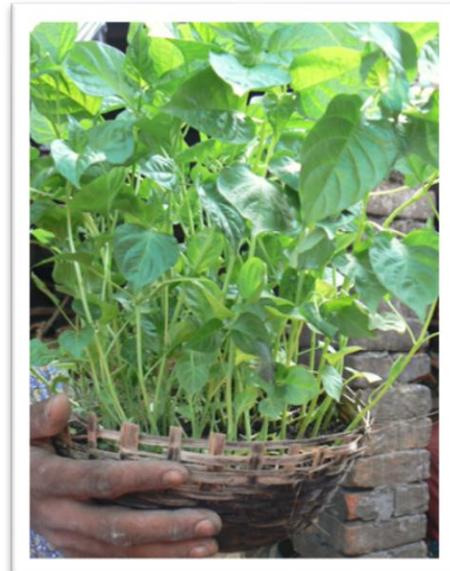
Wide spread preference for local varieties dominates, specifically for red chili, as consumers favor the superior taste and higher quality of chili post drying stage. Farmers in Galachipa tend to grow and use their own seeds for cultivation, as opposed to the commercial variety, to enhance the quality of the chili. However, while the quality of chili is relatively good, the yield of red ripe chili is low at 25-40 kg per decimal. Various hybrid varieties have the potential to vastly increase yield. However, several hybrid varieties have the reputation of producing chili, specifically red ripe chili, at a lower quality. Irrespective of the

significant increase in yield, preference for local varieties remains, because of the emphasis on quality and familiarity. However, a seed seller in Galachipa's central market noted that there are in fact hybrid varieties, specifically Variety United 701, (at 360 Tk per 10 grams) and Variety 653 AR Malik, (at 400 Tk per 10 grams) that increase the yield and quality of red chili. Such varieties of hybrids are popular among nearby farmers who have less land, and who pay more attention to finding ways to increase yield, while still maintaining quality. For green chilies, hybrid varieties are preferred by farmers because of increased production yields. While the production cost for hybrid varieties is higher at 350-400 Tk per decimal, the yield is significantly higher at 110-120 kg per decimal for ripe chili, nearly 3 to 4 times more than local varieties, and therefore advantageous for farmers.

Chili growers in Galachipa cultivate chili using particular agricultural methodologies. Production time takes place from October through April, with planting in October and November and harvesting in March and April. By the end of November, farmers begin undertaking seedling transplantation, which is the most vulnerable time for chili growers due to the potential for crop damage. The seedling transplantation continues for 15-30 days and continues to April when chili becomes ripe.

#### 4.3 Repercussion from Hazards

Cyclones, heavy rainfall and water logging are major disruptions for chili growers in Galachipa, and result in significant crop damage, high cost and a big loss for chili growers. Varying factors such as cooler temperatures, rain and dampness destructively affect transplantation in the months of October, November and December and increase the risk of harvest loss for growers. Heavy rainfall, a consequence of cyclones, in the months of March and April, harm the chili crop during harvesting time, reducing the quality of chili and storage life of harvested chili. Because chili requires dry storage areas, heavy rainfall is problematic as some farmers have to sell their produce at a loss before it is ruined. However, inhabitants complain that they no longer see seasonal indicators, making it increasingly difficult to use their farming knowledge and experience.



7 Atypical Chili Seedling Sold in Galachipa's Central Market

Galachipa is severely affected by changes in rainfall patterns as chili cultivation is widely rain fed. Sporadic rainfall can gravely damage the chili crop during the vulnerable time of harvesting. If heavy rainfall occurs during the seedling stage, it can result in 60% seedling damage. Farmers mentioned heavy rainfall as their biggest obstacle as it aggravates seedling disease, grain discoloration during harvesting, crop damage, and low quality. Fortunately in 2007 Cyclone Sidr did not have negative ramifications on chili cultivation because planting occurred post disaster. However, in 2008, due to heavy rainfall, there was no production of chili in Galachipa. The region was devoid of chili, especially in the month of April, so much so that chili was brought in from Dhaka for local market and consumption.

In addition, farmers in Galachipa are also facing problems with increasing salinity in rivers and canals. This is making it increasingly difficult to ensure sufficient water for crops, and results in soil salinity which ruins crops, and lowers yields, as farmers do not have the appropriate technical knowledge and irrigation techniques to salvage their crops.

Furthermore, due to flooding, markets can be suspended for up to two weeks, and so farmers are unable to bring their produce to market. As a result, during this time some smaller traders use boats to collect chilies, but this is not a feasible option for the medium or large scale farmers. Therefore, price also decreases during the flood season, due to the irregularity of market openings. Additionally, chili cannot tolerate water logging. If crops are subjected to water logging the entire crop is damaged.



#### 4.4 Seasonality Calendar for Chili

The seasonal calendar seen below for the chili market system exemplifies how planting time and seasons have direct impact on yield of chili. Growers of Galachipa cultivate chili after the harvesting of transplant *aman* paddy on the month of October/November. This delayed transplantation affects seedling establishment and growth stage due to cool temperatures and most of the cases give poor yield. Moreover, delayed transplantation creates harvest risk in the month of April when the cyclones hit in the coastal belt. Supply increases during the peak harvesting time in March-May but there is a supply of red chili year round at the Galachipa sub-district *haats* (local market). The chili crop is susceptible to disease and insects during the seedling stage and also at later stages. If there is rainfall during harvesting, the drying process is disrupted which deteriorates the quality of the chili. Transportation from *char* areas is disrupted during cyclone events due to irregular boat services, and requires more time to transport from the *char haat* market areas to distant wholesale markets.

ACTIVITIES	J	F	M	A	M	J	J	A	S	O	N	D
Temperature												
Cyclone				HIGH						HIGH		
Rainfall	LOW		MEDIUM (dependent on cyclone)		HIGH					HIGH		
Chili production cycle	FLOWERING/ FRUITING STAGES		HARVESTING							SEEDLING		GROWTH STAGE
Volume of trade	LOW		HIGH			LOW						
Prices at market			LOW (dependent on cyclone)					HIGH				
Employment opportunities for Labor	HIGH										HIGH	
Risk of crop pests		HIGH							HIGH			
Risk of harvest			HIGH									

## 4.5 Value Chain Map and Description of Market Actors

During the analysis of the chili value chain, more than 12 interviews were conducted with market actors and key informants. The primary actors in the chili value chain include the following:

- Input suppliers
- Producers
- Collectors and traders (small and large scale)

As seen in the value chain map in the next section, several market actors may take on a number of different functions. For instance, most of the farmers produce their own seed and are involved in input supply as well as production.

### 4.5.1 Input Suppliers

Input suppliers provide fertilizer, pesticides, hybrid seeds and pesticide spray equipment to chili farmers. The study team's findings suggest that most *char* chili growers use their own seeds and/or purchase local seeds from neighboring growers, either from their farm gate and/or at the local *haat*. The study team found that there is little demand for hybrid seeds in the Galachipa *char* areas, but recently some of the growers in mainland areas began to cultivate hybrid varieties. However, local varieties are still more popular in the region. The growers and local Department of Agriculture Extension officials reported that the local chili varieties are vulnerable to low temperatures and seedling diseases, and provide poor yields.

There are a large number of *chars* and mainland *haats* in Galachipa sub-district where most of the growers collect their inputs for chili cultivation. The *char* inputs retailers collect their products from local sub-district bazaar and/or Lebukhali market. There are more than fifteen fertilizer, ten pesticide and seven seed shops in the Galachipa bazaar, and approximately 100-120 input suppliers in the Galachipa sub-district. In addition to inputs the chili growers often receive technical information as embedded services from input suppliers.

### 4.5.2 Producers

There is a higher concentration of chili production in the coastal *char* and adjacent main land areas. In *char* areas, small scale chili growers (approximately 75 %) have less than one acre of land; medium scale chili growers (approx. 20%) have between one to two acres of land; and large scale chili growers (approx. 5%) have more than two to twenty acres of land. Nearly all these growers produce chili as a cash crop, and it is one of their main sources of income. They consume a portion of their production and sell the remaining volume directly to the traders in open markets, or sometimes from their farm gate. Both green and ripe red chilies are sold in the market. Green chili is sold immediately after harvest, but ripe ones need to be dried, packed and stored for selling at a later stage.

The chili growers in Galachipa cite the local varieties as good but very vulnerable to seedling diseases and cool temperatures in the early growing stage. Additional challenges include the high cost and limited availability of quality inputs such as pesticides and fertilizers. Moreover, they lack technical skills in using appropriate inputs, utilize traditional production techniques (as opposed to modern practices), and have limited access to appropriate post-harvest handling opportunities such as suitable drying grounds, storage and preservation.

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#### 4.5.3 Collectors and Bulkers

Chili traders play vital roles, to varying degrees, in marketing local chili in distant markets. Their roles are as follows:

##### *Small Scale Chili Trader*

Small chili traders typically buy the green and ripe red chili from growers and transport them to the market. They also purchase chili from open markets and sell to retailers or large traders in local markets on the *haat* day. They use their own finance to purchase green or ripe chili. In most cases, they sell immediately after purchase, but sometimes, they store chili for a few days to get a better profit margin. There are approximately 80-100 small scale chili traders in the Galachipa sub-district.

##### *Large Scale Chili Trader*

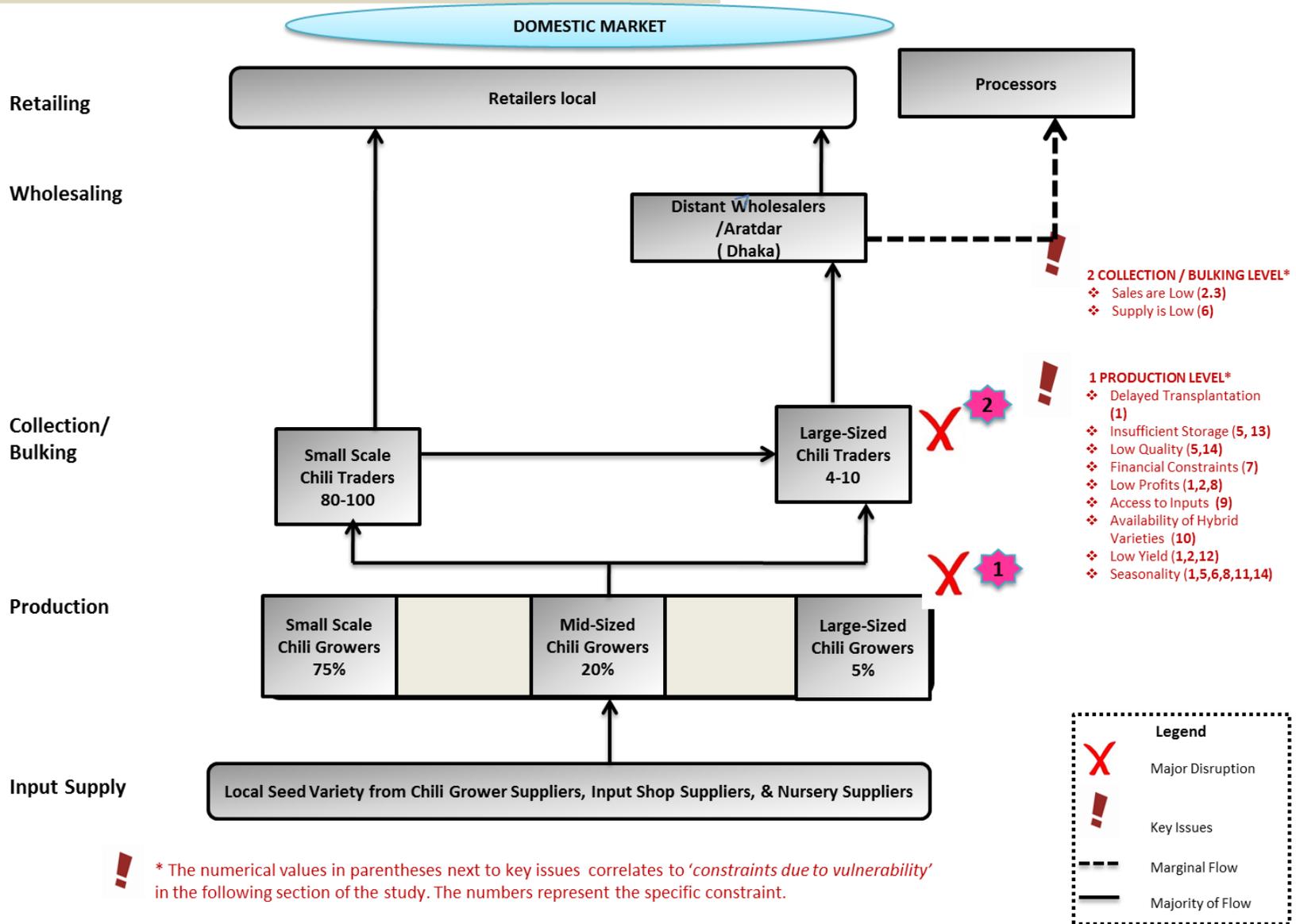
They purchase large amounts of chili from small traders and also a significant amount directly from chili producers of local *char* and mainland *haats*. They collect and store chili for bulking in rental “godown” or storehouse and transport the chili generally once/twice in a week for selling at the national level wholesale market at Dhaka. There are approximately 4-10 large scale chili traders in Galachipa’s sub-district.

The study team’s findings suggest that most of the traders face similar problems, such as: transporting chili to the market during times of cyclone, a shortage of working capital, and an inability to source consistent quantity and quality of chili due to heavy rainfall, cyclones and other disasters during the harvesting period.

#### 4.5.4 Retailing and Processing

The study team’s findings suggest that from the wholesale selling at Dhaka, most of the chilies go to retail selling, and a minimal portion goes to processors by company agents for processing purposes. Generally, the retail sales go for home consumption, while the chili processors use green and ripe red chili to make processed products like chili sauce, and red chili powder.

## Galachipa Upazila, Patuakhali District: Chili



#### 4.6 Constraints due to Vulnerabilities, Market Based Solutions, and Potential Facilitation Activities

A number of constraints due to vulnerabilities were identified in the chili value chain. For each constraint, the team developed potential market-based solutions to the constraint and potential facilitation activities that development organizations may use to support market actors to develop and implement these market-based solutions. Constraints, market-based solutions, and potential facilitation activities can be found in the table below.

	CONSTRAINT DUE TO VULNERABILITY	MARKET BASED SOLUTION	POTENTIAL FACILITATION ACTIVITIES
1	Delayed transplantation in the months of November-December for local chili varieties exposes chilies to cool temperatures and rainfall, which results in damage to seedlings, poor yield, decrease in profit and increased risk of harvest loss for the growers.	Access to higher quality (cold tolerant, dew tolerant, etc.) inputs for farmers, for planting  Promote among farmers, early variety of rice in the cropping pattern	Support seed companies to promote higher quality inputs (i.e. stress tolerant) and appropriate production technologies (line sowing, use of seedlings, etc.)  Support nurseries to cultivate chili seedlings and market these in the <i>chars</i> and mainland areas  Support seed companies, seed sellers and lead farmers to promote early varieties of rice
2	Local varieties give very poor yield, and are vulnerable to higher seedling damage by pest and disease attack, which is exacerbated by cooler temperatures resulting in low yield and a decrease in profit for chili producers.	Access to information for farmers regarding chili varieties	See #1 above
3	A decrease in chili sales and the need for storage are repercussion of the cyclone warning system. However, due to the limited storage in households/warehouses, farmers cannot store chili which results in total loss for the growers.	Access to raised storage facilities for farmers to dry chilies	Support traders, lead farmers, etc. to develop raised storage facilities for rent to chili growers
4	Farmers lack technical awareness of modern production techniques that are more durable in cooler temperatures such as the use of balanced fertilizers, and the use of appropriate varieties suitable for the region. Therefore, implementation of familiar methods of cultivation, result in	Access to modern production technologies for farmers	Support seed companies to promote appropriate production technologies (line sowing, use of seedlings, etc.)  Support farmers in gaining skills required

	crop loss, lower yield, decrease in profit and increased cost for growers.		to implement modern cultivation techniques
5	Heavy rainfall and or cyclones during harvesting time in the months of March-April reduce the quality of chili and reduce storage life of harvested chili, resulting in decreased profitability for growers.	Access to improved drying techniques and/or drying grounds for farmers	Support traders, lead farmers, etc. to promote improved drying techniques and/or establish improved drying grounds for rent to farmers
6	Cyclones hamper normal supply of chili in the market as well as diminish trading opportunities, resulting in lower income for both growers and traders.		
7	Post cyclone in the months of November-December, growers lack access to capital to purchase additional inputs and seeds for replanting, and therefore resort to obtaining loans, with high interest rates, from money lenders.	Access to credit (in cash or in kind) for farmers	Support input suppliers to extend credit in-kind to farmers  Support financial institutions (e.g. MFIs) to develop loans for growers
8	Once a crop is damaged due to cyclone/floods, rehabilitation efforts are put in place to substitute damaged crops with other crops such as mustard, vegetables, and maize. Such crops fare better in the winter, however are less profitable and result in an overall loss for the growers.	See #1 above	See #1 above
9	Post disaster, farmers require immediate access to inputs, seeds and seedlings. The input supply system is disrupted due to damage of seedbed and seedlings, as well as the supply of seedlings from neighboring sources, hampering prompt replantation for growers.	See #1 above	See #1 above
10	Seedlings of unknown quality, varieties and ages are sold in the local <i>haat</i> areas, which increases crop loss, lowers yield and decreases profit margin for farmers.	See #1 above	See #1 above
11	Certain hybrid varieties have the potential to grow well in cooler temperatures and increase yields comparatively well, as opposed to local varieties, however are unavailable at	See #2 above	See #4 above

	<p><i>char</i>/adjacent shops. Furthermore, the linkages between farmers and input supply companies that market such hybrids are weak. The lack of communication between these market actors encourages the farmers to use local varieties that cannot withstand cooler temperatures, and therefore generate lower yields.</p>		
12	<p>Low embankments allow sea water to enter into adjacent villages during times of cyclone and tidal surges resulting in a loss of standing crops, and undermining the productivity of the soil for growth of new crops.</p>	<p>Access to high level of embankments for stakeholders</p>	<p>Motivate local government bodies, lead farmers, etc. to raise/repair embankments</p>
13	<p>Lack of opportunities for storing chili in protected warehouses or homesteads often result in total loss for farmers.</p>	<p>See #3 above</p>	<p>See #3 above</p>
14	<p>Lack of drying ground infrastructure leads farmers to use sand or roof tops for drying chili. However, rain/cyclones inhibit proper drying of chilies and diminishes quality resulting in a lower selling price for the growers.</p>	<p>See #5 above</p>	<p>See #5 above</p>

**A set of potential facilitation activities aiming to reduce vulnerability in the chili value chain include supporting:**

- nurseries to cultivate chili seedlings and market these in the *chars* and mainland areas
- seed companies to promote higher quality inputs and appropriate production technologies (line sowing, use of seedlings, etc.)
- seed companies, seed sellers and lead farmers to promote early varieties of rice in the cropping pattern
- processors, traders, lead farmers, etc. to develop raised storage facilities for rent to chili growers
- input suppliers to extend credit in-kind to farmers
- financial institutions (e.g. MFIs) to develop loans for growers
- farmers in skills required to implement modern cultivation technologies
- processors, traders, lead farmers, etc. to promote improved drying techniques, and/or establish improved drying grounds for rent to farmers

#### 4.7 Implications for Relief and Recovery Efforts

Given the importance of planting appropriate varieties of chilies at the proper times, relief and recovery efforts should focus on rehabilitating input suppliers, and ensuring that appropriate varieties of chili seeds and seedlings (or alternative crops) are available for farmers to purchase. In the event of heavy rainfall and or cyclones in the months of March and April, the quality of harvested chili is diminished, and it becomes critical to improve drying techniques and/or establish improved drying grounds, and storage facilities for farmers.



Seed Inputs



Chili Producers



Collecting Chili for Trade

## 5. POND FISHERIES

### 5.1 Rationale for selection of Pond Fisheries

Although the pond fishery sector in Bangladesh is small, it accounts for 4.86% of the GDP with 12.5% of the population relying on fishing and ancillary occupations.<sup>21</sup> Approximately 40% of the total fish production in Bangladesh is produced from closed water fisheries<sup>22</sup> (i.e. ponds). Pond fisheries are extremely vulnerable to natural hazards, and nearly every household in Galachipa has access to a pond. However, despite the ubiquity, most ponds are underutilized for productive purposes, and therefore, there is tremendous potential for economic growth, thus making it a critical economic value chain to consider for analysis.



8 Sample Nursery Pond in Char Kazal

### 5.2 End Markets and Competitiveness

Because of the popularity of pond fisheries in the southern part of the country, the majority of farmers in Galachipa either own, or have access to, some form of pond fishing activity. Nearly every household has small ponds to raise fish, and given Patuakhali's proximity to water, many people are engaged in fishing activities. Most people cultivating pond fisheries do so as a secondary or sporadic source of food or income, and as such, do not invest much time or planning, and therefore do not practice proper pond management.

These fisheries are most commonly used for household consumption as opposed to commercial purposes, and so while they are important for household food security there is a missed opportunity for commercial profitability. For instance, in Boalia Village there are approximately 300 pond fisheries, and of these, only 10% of pond owners utilize ponds for commercial purposes, whereas 90% of owners utilize ponds exclusively for household consumption.<sup>23</sup> Moreover, the majority of those that do sell their fish, do so at the local bazaar, which is opened in the morning and evenings, to local clientele. However, as demand for fish increases in the area, so too is there an increasing trend for pond owners to sell their fish to traders who transport and sell the fish in Galachipa and distant areas.

Discussions with the Upazila Fisheries Officer also revealed that the sales price of fish in Galachipa was high with market traders having a pre negotiation with fishermen to determine the price of fish in advance of the catch. Payment is often made in a lump sum to the fishermen, to incentivize them further to enter into these pre negotiated deals.

Due to the increasing demand of fish for the growing population of Bangladesh, pond fish culture is quickly becoming popular among farmers of rural Bangladesh as a means to increase income. It is a highly lucrative and profitable business with high profit margins. For a 1.5 decimal sized pond, a farmer can

<sup>21</sup> Bangladesh Economic Review, 2006. Economics Division, Ministry of Finance. Government of the Peoples' Republic of Bangladesh.

<sup>22</sup> *ibid*

<sup>23</sup> Interview with large commercial pond owner in Boalia Village

make a profit between 7,000 to 10,000 Tk per season, and for a 68 decimal sized pond a profit of 100,000 Tk per season. However, farmers in Galachipa currently lack knowledge of modern fish cultivation techniques, such as the utilization of suitable quick growing fish species during fish cultivation.

In order to increase commercial viability, ample resources, effective pond management and appropriate agricultural methodologies are essential for the success and prosperity of fishers and pond owners. Recent efforts have been made to develop local fingerling sources, to strengthen the skills of nursery men, and to build the capacity of pond owners' technical skills however, development is still in its infancy stage. The Fisheries Department established six nurseries in three unions and one of those is in Galachipa Union. Typically, seeds are collected from local neighboring districts. However, there are new local pond nurseries with fingerlings readily available. The opportune time for cultivation is to release fingerlings in May and harvest can occur throughout the year; however, many farmers strategize the timing of a partial harvest to take place just before the cyclone season. Those farmers that cultivate fish year round increase their opportunity for profitability and by taking preparative measures for strategic partial harvest will minimize risk. Minimal labor is required for pond fisheries; however, effective pond management is crucial to improve the condition of the fish. In terms of pond ownership, there are individual and shared ownership arrangements. Individual ownership of a pond can be rather costly. However, there are also notable challenges with joint ownership of these assets. One individual shared his experience of being one shareholder among 26 shareholders, and the difficulties he faced with regard to pond management and agreeing on unanimous business decisions.

### 5.3 Repercussion from Hazards

Despite the recent progress made with expanding pond fisheries, farmers still face a number of tangible challenges and vulnerabilities when it comes to this income generating activity, specifically when confronted with natural hazards.



9 Pond Fish used for Commercial Purposes

As a result of its proximity to the Bay of Bengal, Galachipa's mainland as well as *chars*, are vulnerable to a number of disasters and hazards including cyclones, tidal surges, and flooding. Pond fisheries are extremely vulnerable to natural disasters as the water can become high in salinity, fish can be swept away, and embankments can be destroyed, usually taking up to two months post disaster for a pond to return to normal. Futile attempts to protect ponds through utilization of netting and polythene sheets as protective measures are not effective when tidal surges hit, and therefore, farmers have resigned themselves to recommence their endeavors post disaster. However, netting can be useful as a moderately effective means of protection when ponds endure heavy rain and minor water logging. Post disaster, farmers incur a total loss and are not privy to the benefits of strategic partial harvest and year round cultivation.

Furthermore, most of the inputs for homestead aquaculture are provided by mobile traders who source fingerlings from Jessore and Khulna district. In times of severe natural hazards, the fish market stops functioning. In the months following disasters, farmers find it more difficult to source fingerlings, in terms of quality, size, and quantity which exacerbate the considerable delay in restarting their aquaculture. The delay is primarily attributable to waiting for the salinity to decrease and difficulty in sourcing the

fingerlings. However, it is also a consequence of the disjointed network of nursery men, who have an insufficient stock of fingerlings.

Poor market facilities are aggravated during and post disasters, and act as a barrier to successful pond fisheries. Due to poor transportation systems in Galachipa, farmers mostly sell their harvested fish in the local market near their homes, and do not venture to the bigger markets in Galachipa town. Farmers also do not have their own chilling systems or access to sufficient ice for preserving harvested fish, resulting in the urgency for them to sell their harvested fish at low prices due to risk of fish spoilage.

Additionally, due to natural hazards there is great potential for financial risk and total crop loss. In times of grave natural disasters total crop and financial losses are incurred with respect to pond fisheries, furthering the existing vulnerability of inhabitants who have also lost other significant assets and face destruction to their homesteads. As a result they assume debt and take on loans with high interest rates of 15% to repurchase inputs.<sup>24</sup> There are currently no preventative measures available to protect ponds from the severity of the storms. Therefore, despite the potential for a highly lucrative and profitable market, there is unavoidably high risk for financial loss.

Additionally, proper technical knowledge on pond management prior to and post disaster is critical for maintaining the profitability of pond fisheries. Farmers cited a serious dearth of extension services necessary to promote pond management. Farmers mentioned that it is common to “just release fingerlings into the pond and hope for the best” without utilizing other cultivation mechanisms. Furthermore, farmers mentioned the prevalence of fish diseases that few farmers know how to deal with, and the need for technical support with disease control.



*10 Sample Nursery Pond on Char*

#### **5.4 Seasonality Calendar for Pond Fisheries**

The seasons have a direct impact on fish cultivation as production is hampered by cyclones, tidal surges or severe floods. Generally cyclones hit pre-monsoon at the month of April, and post-monsoon at the months of October-November in the Galachipa as well as coastal belt areas. Both periods have a significant threat of loss for pond fisheries as sudden cyclone and tidal surges may wash out the culture ponds.

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<sup>24</sup> Interview with Pond Fish Owner

Fingerlings availability increased in the month of May-July and gradually lessened at later months of the year. Some nursery men make a stock of fingerlings after the peak season with a bulk stock in ponds during winter season, with a target to sell in the months of February-March. These over wintering fingerlings are good for quick growth and off season cultivation. The safe period of production is between May-September and partial harvest is recommended before October-November.

Besides the peak cyclone months, other months are safe for commercial pond fish cultivation using quick growth fish species. Prices of fish are high during the months of March-May as there is less supply.

ACTIVITIES	J	F	M	A	M	J	J	A	S	O	N	D	
Cyclone				HIGH						HIGH			
Rainfall	LOW			MEDIUM (dependent on cyclone)	HIGH				HIGH( dependent on cyclone)		LOW		
Fish seeds production at Hatchery				PRODUCTION									
Fingerling availability	LOW				HIGH			LOW					
Fish Cultivation	YEAR ROUND CULTIVATION												
Volume of sales	LOW				HIGH		LOW			HIGH		LOW	
Prices at market	MEDIUM		HIGH			MEDIUM							
Risk of loss	LOW			HIGH		LOW				HIGH		LOW	

### 5.5 Value Chain Map and Description of Market Actors

During the analysis of the pond fisheries value chain more than 10 interviews were conducted with different market actors and key informants. The primary actors in the pond fisheries value chain include the following:

- Input suppliers (Fish nursery men, fish fingerling traders, feed sellers, ice suppliers and related input suppliers)
- Producers (small scale individual, joint and commercial large scale fishers)
- Collectors and wholesalers (local and distant)
- Retailers (local and distant)

#### 5.5.1 Input Suppliers

Input suppliers of the pond fisheries value chain are limited to fish nursery men, fingerling traders (hawkers), feed as well as other necessary chemical suppliers and ice suppliers. There is no fish hatchery in Galachipa sub-district. That's why the local nursery men collect fish seeds from distant sources, especially from Khulna and Jessore, and rear in the nursery ponds before selling to local pond fish producers. Moreover, some fingerling traders also bring fish from distant sources and carry the fingerlings in silver cans (in Bengali called *Patil*) to sell among interested buyers. There are five fish feed sellers at Galachipa headquarters. They also sell other water purifying chemicals and nets. Demand for fish feed is increasing day by day as many pond owners are undertaking commercial fish cultivation due to a growing awareness of, and profit from, pond fish cultivation.

The study team found that there are a large numbers of fallow ponds in most of the communities which can be converted to commercial cultivation. During discussions, the study team also learned that pond cultivation did not attain popularity due to a risk of fish losses during tidal surges and floods. Moreover, there is a lack of local sources for quality fingerlings, and farmers remain unaware about modern cultivation techniques. There is also a lack of technical services from public and private sector organizations.

### 5.5.2 Producers: Pond Fish Producers

#### *Small Scale Pond Fishers*

In the sub-district most households own a pond but rarely cultivate fish in commercial ventures. Some of them started fish cultivation semi-commercially, but most of them are not aware about modern cultivation techniques and proper pond management practices. They use the pond water for cleaning as well as for fish cultivation purposes.

#### *Joint Pond Fish Producers*

Joint pond fish production is not common in Galachipa but one NGO funded project organized joint pond fish cultivation for their 100 community based organization (CBO) members. They facilitate the members to organize leasing out of the ponds and provide technical supports for pond fish cultivation. The CBO members manage the production and distribute profits among all of their members.

#### *Commercial Large Scale Fishers*

There are also some large scale commercial fishers in Galachipa sub-district. They cultivate fish in large areas mostly by using their own ponds, or taking leases from others, and employ hired laborers for fish cultivation. They are knowledgeable cultivators, risk takers and have good linkages with fingerling nursery men, local fisheries officers, as well as with distant fish *arats* and fish traders. They usually sell fish in the distant fish *arats* as well as send fish to the national level wholesale market.

### 5.5.3 Collectors and Wholesalers: Fish *Aratdar*

There are two types of fish wholesalers in the study area and they are:

#### *Local Fish Aratdar*

There are 40-45 fish *aratdar* in the mainland as well as in *char* areas, who are playing lead roles in selling fish from capture fisheries sourced from the river and coast, as well as from culture pond fisheries. This is a famous area for capture fisheries but culture fish is also sold in the *arat*, and then transported to local retail and distant markets. The *aratdars* make open bids for the fish and charge commission to the fish owners. Mostly small scale local pond fishers sell in the local *arat*. The *arat* generally opens two times a day, early in the morning and again in the afternoon.

#### *Distant Mainland Aratdar*

Mainland *aratdars* play a vital role in bulking fish and sending them to the distant wholesale markets. They have also good linkages with the local level *aratdar*. Some of them have agents in the fish landing stations to collect fish for their *arat*. Some of them also undertake informal lending to the local agents. Mostly, the commercial large scale fishers are the ones that sell culture pond fishes in the distant mainland *arat*.

### 5.5.4 Retailers

After wholesaling, most fish go to local level retailing for consumption.

**Local Fish Retailer**

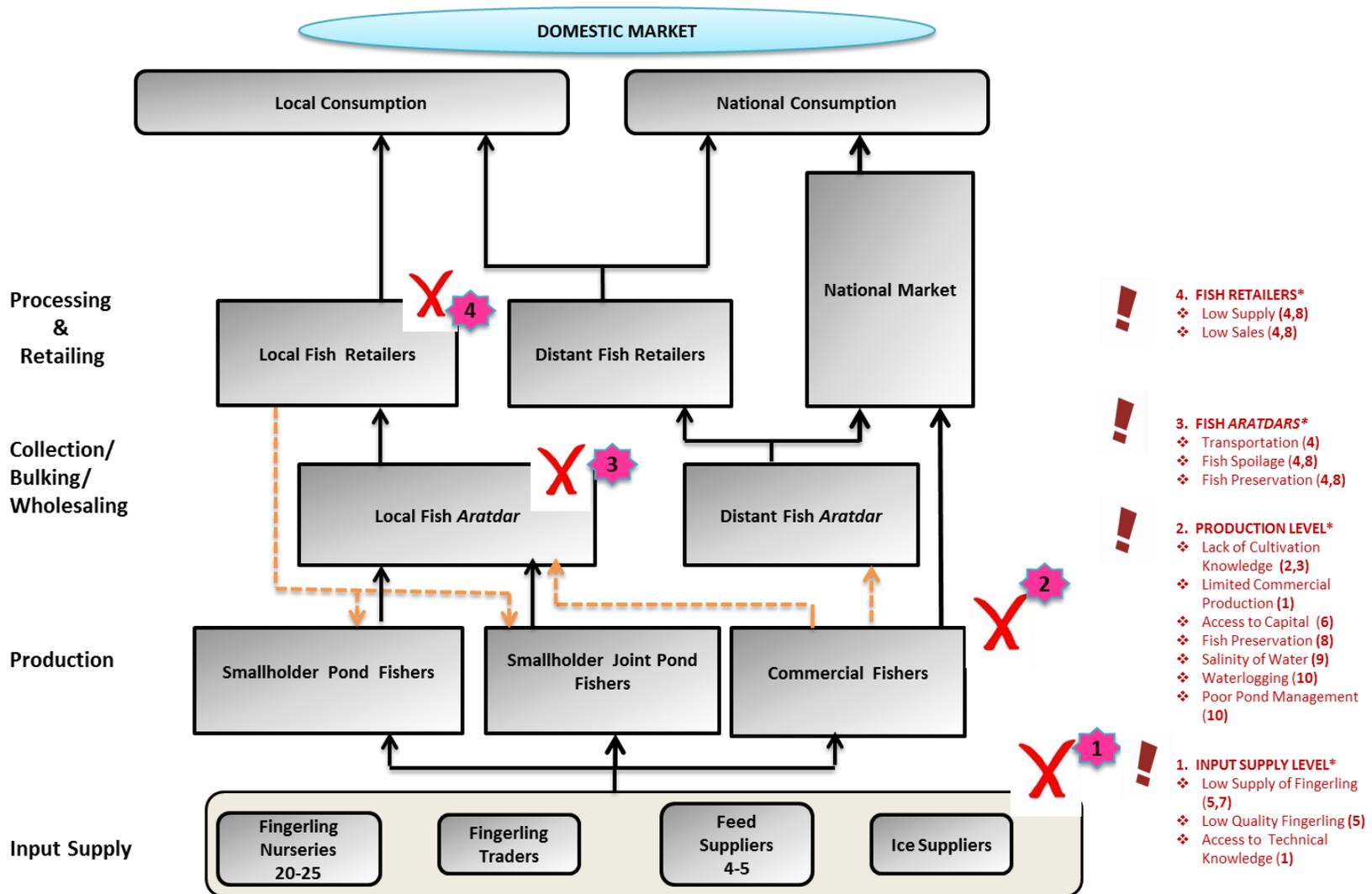
They are the key actors in selling fish in local markets. Mostly they collect fish through open bid from the local *arat* and then sell among the local consumers. There are approximately 150-200 fish retailers in Galachipa sub-district.

**Distant Fish Retailer**

Generally these fish retailers stay in the mainland areas. They collect fish from the *arat* and sell among the local consumers.



## Galachipa Upazila, Patuakhali District: Pond fisheries



! \* The numerical values in parentheses next to key issues correlates to 'constraints due to vulnerability' in the following section of the study. The numbers represent the specific constraint.

### 5.6 Constraints due to Vulnerabilities, Market Based Solutions, and Potential Facilitation Activities

A number of constraints due to vulnerabilities were identified in the pond fisheries value chain. For each constraint, the team developed potential market-based solutions to the constraint and potential facilitation activities that development organizations may use to support market actors to develop and implement these market-based solutions. Constraints, market-based, solutions and potential facilitation activities can be found in the table below.

	CONSTRAINT DUE TO VULNERABILITY	MARKET BASED SOLUTION	POTENTIAL FACILITATION ACTIVITIES
1	Pond fisheries are vulnerable to tidal surges and floods which reduce interest in farmers to invest in commercial fish cultivation, in adjacent <i>char</i> and risky mainland areas, resulting in missed opportunities for farmers to benefit from a commercially viable market.	Access to suitable fish species for fish cultivators to increase growth rapidly (Quick growing, over wintering fingerlings, etc.)  Awareness of safe production and harvesting times for fish cultivators	Develop new local nursery men and support existing nursery men to promote good quality fingerlings and appropriate production technologies (quick growing fish species, over wintering/large size fish fingerlings, use of safe cultivation season etc.)  Support fish feed and chemical marketing companies to promote improved feed and water purifying chemicals  Support lead farmers to promote quick growing fish species  Support <i>aratdars</i> to disseminate information to farmers on ideal times for production and harvesting and the benefits incurred by year round and strategic partial harvest.
2	Lack of knowledge of modern fish cultivation techniques inhibits optimum benefit from pond fish cultivation, and decreases profitability of fish cultivators.	Access to modern fish cultivation technologies for farmers	See #1 above
3	Lack of cultivation for suitable quick growing fish species, which compensate for the loss endured due to cyclones, reduce chances for increased profitability of farmers from fish cultivation.	See #1 above	See #1 above
4	Ramifications of cyclones distort transportation services	Access to ice and cold storage	Support ice millers to produce ice with

	from <i>chars</i> to mainland, and mainland to distant wholesale markets, rendering <i>char</i> fish cultivators more vulnerable to fish spoilage due to ice shortage, as well as decreased access to the mainland local and distant markets.	facilities for short term preservation	special arrangements, and assist traders, fish farmers etc. to organize storage facilities for rent
5	Post disaster, there is a limited supply/stock of quality, sizeable fingerlings for pond producers to purchase, resulting in diminished benefit from pond fish cultivation.	Access to sufficient quality stock/supply of fish fingerlings for producers	Support nursery men to develop networks and maintain quality stock/supply of fish fingerlings
6	Limited access to capital inhibits fish cultivators from collecting fingerlings, to restart their fish cultivation post cyclone and tidal surges.	Access to credit (in cash or in kind) for producers	Support fingerling suppliers to extend credit in-kind to farmers  Support financial institutions (e.g. MFIs) to develop loans for growers
7	Cyclone and tidal surges destroy local fish fingerling sources. Unavailability of local fingerlings increases high mortality of released fingerlings, which ultimately lessens the fish culture profitability.	See #1 above	See #1 above
8	Post cyclone there is an increase in fish spoilage, as there is a limited supply of ice which could be utilized to preserve fish. Therefore sales in distant markets drop significantly.	See #4 above	See #4 above
9	Severe disaster results in inundation of saline water in ponds, causing fish loss and destroying productivity of fish cultivation for at least 1-2 seasons for farmers.	Access to high level embankments for stakeholders	Support interested stakeholders to motivate local governmental bodies, lead farmers, etc. to raise/repair embankments
10	Due to heavy rainfall, and impact from tidal surges, water logging occurs which destroys potential for fish cultivation. Damage to ponds is exacerbated by farmers' poor pond management resulting in total or decreased loss for farmers.	Access to improved drainage system for stakeholders  Access to improved pond management for producers	Support interested stakeholders to motivate local governmental bodies to improve drainage systems to diminish water logging  Train farmers in technical methods to improve pond management such as remedies for polluted water, saline water management, sourcing fingerlings, pond preparedness (utilization of durable netting, raised dikes).

**A set of potential facilitation activities for the pond fisheries value chain include supporting:**

- development of new nursery men and capacity building of existing nursery men to promote good quality fingerlings and appropriate production technologies (quick growing fish species, over wintering/large size fish fingerlings, use of safe cultivation season etc.)
- fish feed and chemical marketing companies to promote improved feed and water purifying chemicals in the areas
- *aratdars* to disseminate information farmers on safe production and harvesting times, as well as methods to reduce risk to disaster through year round cultivation and strategic partial harvest pre cyclone seasons.
- lead farmers to promote quick growing fish species cultivation during the safe production season
- nursery men to develop a network with other nursery men to maintain a quality stock/supply of fish fingerlings (over wintering fingerlings) in the region for cultivation in the safe season
- ice millers to produce ice with special arrangement during time of disaster and assist traders, fish farmers etc. to organize storage facilities for their fish on rental basis
- nursery men and other input suppliers to extend credit in-kind to pond fish farmers
- financial institutions (e.g. MFIs) to develop loans for pond fish farmers
- stakeholders to motivate local governmental bodies, lead farmers, etc. to raised/repair embankments

### **5.7 Implications for Relief and Recovery Efforts**

Given the importance of quality fingerlings, relief and recovery efforts can reduce the risk of disaster of cyclones by developing a network among market actors to maintain a quality stock/supply of fish fingerlings in Galachipa in order to restart pond fish cultivation post disaster. In the event of a disaster, access to ice and cold storage facilities for short term preservation of pond fish is crucial. Therefore, relief and recovery efforts should focus on supporting the capacity of ice millers to produce ice, and assist traders, and fish farmers to organize storage facilities in order to preserve their fish and enable them to access markets.

## 6. RECOVERY VALUE CHAIN ANALYSES

### 7. CGI (Corrugated Galvanized Iron) Sheets

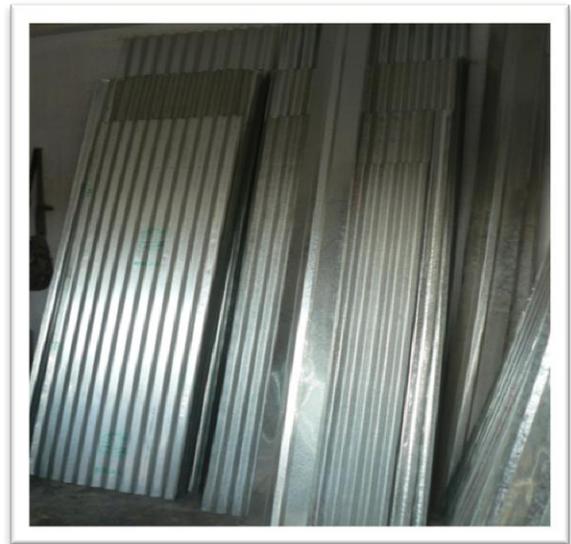
#### 7.1 Rationale for selection of CGI Sheets

CGI sheets are an essential recovery value chain in relief and reconstruction efforts with materials having to be purchased or distributed for the rebuilding of homes in the aftermath of natural disasters. CGI sheets are particularly high priority in the Galachipa area as the region is more susceptible to sudden calamities such as cyclones and tidal surges when homes are completely destroyed with little scope to salvage original building materials. It is likely that local CGI sheet market actors have the capacity to play significant roles to increase rebuilding efficiency initiatives and to boost economic growth of local current markets.

#### 7.2 End Markets and Competitiveness

Nearly every home in Galachipa is built with corrugated galvanized iron sheets, commonly abbreviated CGI. CGI is a building material composed of sheets of hot-dip galvanized mild steel, cold-rolled to produce a linear corrugated pattern in them. The corrugations increase the bending strength of the sheet in the direction perpendicular to the corrugations, but not parallel to them.<sup>25</sup> CGI is lightweight, affordable, and easily transported making it an ideal medium for building material in Galachipa. Although galvanizing attempts to inhibit the corrosion of steel, rusting is inevitable, especially in coastal areas like Galachipa where the salt water induces rust. However, in Galachipa, the biggest threats to the use of CGI are natural hazards such as tidal surges and cyclones which completely damage and destroy homesteads constructed of such building materials.

The quality of CGI correlates with its price, ranging from 1,400-9,500 Tk per 72 square feet. The higher the price, the more durable, and the more likely it is to withstand natural disaster. The following chart demonstrates how price directly relates to durability of CGI.<sup>26</sup>



11 Corrugated Galvanized Iron (CGI) Sheets

<sup>25</sup> [http://en.wikipedia.org/wiki/Corrugated\\_galvanised\\_iron](http://en.wikipedia.org/wiki/Corrugated_galvanised_iron)

<sup>26</sup> Interview with CGI Retailer

Figure 3: Patuakhali District- Price and Quality of CGI Sheets in relation to Local Usage and Durability

Quality	Price Range (per 72 square feet)	% of People Purchased	Years of Durability (with minimum risk)
<b>Lowest</b>	1400-2500 Tk	75%	7-8 years
<b>Mid</b>	2500-3500 Tk	20%	25 years
<b>High</b>	9500Tk	5%	35+ years

However, in instances of severe natural disasters, no CGI sheet irrespective of quality can withstand the force of detrimental winds. The CGI sheet retailer noted that the highest quality CGI has the highest probability of withstanding heightened winds; however, because of its cost consumers rarely purchase this high standard category of CGI.

The demand for CGI in Galachipa post disaster is contingent on the economic situation of inhabitants. For instance in Ulania *haat*, in 2007 post cyclone Sidr, demand for CGI did not increase significantly because Ulania Ratandi *Char* is a particularly poor region, and the majority of people could not afford to purchase new CGI sheets in order to rebuild. Typically, however, during times of major disasters demand for CGIs increase fivefold during a crisis period, peaking for the duration of one month and then gradually decreasing. Inhabitants either take reactive approaches purchasing CGIs immediately post disaster, or preventative approaches, purchasing CGIs prior to seeking emergency shelter. Consumers are comprised of local inhabitants, NGOs, school committees through governmental facilitation, etc. NGOs play an active role in purchasing CGI sheets at the open market or assisting beneficiaries in purchasing CGIs directly from retailers. Some NGOs implement a cost sharing system post disaster where out of every ten sheets purchased the NGO purchases seven sheets and the beneficiary purchases the remaining three.

The main brands of CGI sheets were identified as PHP, Arabian, KY, with shop owners having direct contact with suppliers across Bangladesh. In both target areas, local businesses were extremely well connected to larger retailers and suppliers in bigger cities. For example, in Galachipa, CGI vendors sourced stock locally from Barisal and Jhalokathi and also from further afield such as Chittagong and Dhaka.

### 7.3 Repercussion from Hazards

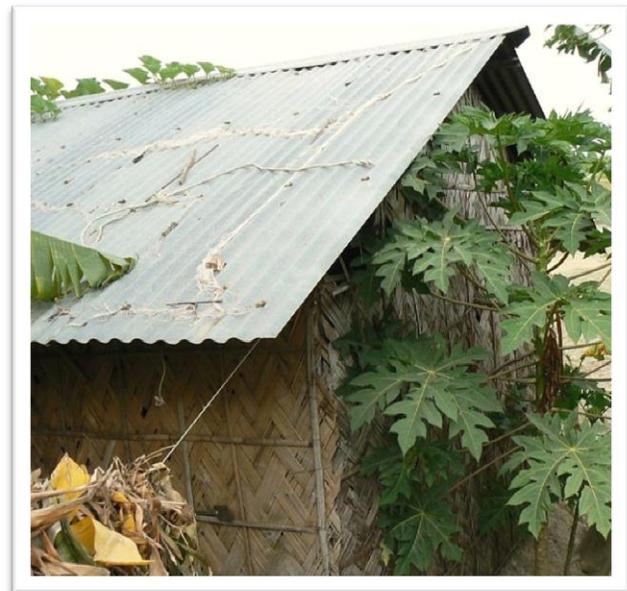
While cyclones and tidal surges are a sporadic occurrence in Galachipa, the substantial impact of large scaled hazards cause mass destruction, and therefore greatly influences the CGI value chain.

#### **Destruction of Homestead**

During times of severe hazards, high winds and tidal surges, have the potential to completely destroy homes. Due to the poor structural design of homes, as well as utilization of low quality CGI sheets, homesteads are highly vulnerable to the detriments of disaster.

#### **Price Increase**

The volume of sales naturally increases post disasters which results in a price increase. In



12 Sample Home in Paan Poti utilizing CGI

Galachipa after cyclone Sidr prices of CGIs increased by 20% due to limited supply and increased demand, as well as embedded increased transport costs due to the disruption in transport links. NGOs sourced CGI sheets for relief efforts from distant sources, resulting in reduction of sales for local CGI sellers, and causing local market distortions.

**Transportation**

Typically CGIs are transported by trucks and waterways, but during disasters trawlers are a more suitable mode of transport as they can access areas which remain submerged for longer periods. In terms of transportation, road communications require up to one month for complete reparation post disaster. However, generally, after one week post disaster the majority of normal transportation ensues. High signals which forewarn inhabitants of hazards temporarily stifle mobility on river ways, and once the signal subsides, normal movement resumes after two to three days.

**Restock Supply**

In order to restock supply, CGI retailers never procure CGIs from other neighboring areas immediately post disaster due to the detriments of transportation and need for immediate recovery and relief efforts. Generally, it takes between 15-20 days post disaster to restock supply and purchase new materials from varying areas. The delay in restocking supply stifles sales; however, in general there are typically ample CGIs in stock to meet the increased needs of consumers post disaster.

**NGO Relief Support**

Post disaster relief services come from governmental and NGO efforts, and among those relief services is the provision of CGIs to inhabitants to reconstruct their homes. In Galachipa, post disaster, 25% of people rely on NGO support for reconstruction materials. Of the 25%, 15% have genuine financial restraints and cannot afford to repurchase materials to reconstruct their homes. In an effort to temporarily alleviate destruction, those inhabitants utilize straw and broken down CGI, a significantly less durable material, as a transitory solution, while maintaining hope to receive financial assistance from developmental agencies. The remaining 10% of people who receive assistance from NGOs is comprised of people who can afford reconstruction materials but are 'freeloaders' and manipulate the system, and therefore delay reconstruction in hopes of receiving materials free of charge.<sup>27</sup> Additionally, post disaster NGOs frequently purchase CGIs from distant markets and distribute them locally, which results in market distortion and hampers the local economy.

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<sup>27</sup> Interview with CGI Sheet Seller

### 7.4 Seasonality Calendar for CGI

The seasons have a direct impact on the availability of CGI sheets as sudden demand increases after the cyclone or other natural disasters. Mostly, CGI sheets are used to repair or build new houses after the disaster. The price goes up immediately after the disasters but gradually comes to a flat rate within a few months. The pricing and demand depend on the severity of disasters and how many households are affected during the time of hazards.

It is reported that local sales also remain low as most relief operating organizations collect CGI sheets from distant sources. This affects the short term businesses of local traders and money flows at the local level.

ACTIVITIES	J	F	M	A	M	J	J	A	S	O	N	D
<b>Cyclone</b>	LOW		HIGH	LOW				HIGH		LOW		
<b>Rainfall</b>	LOW		MEDIUM (dependent on cyclone)	HIGH				HIGH (dependent on cyclone)		LOW		
<b>Volume of sales</b>	MEDIUM		LOW	HIGH (dependent on cyclone)		LOW				HIGH (dependent on cyclone)		
<b>Prices at market</b>	MEDIUM			HIGH	MEDIUM			LOW		HIGH		
<b>Demand</b>	MEDIUM			HIGH (dependent on cyclone)		LOW				HIGH (dependent on cyclone)		

## 7.5 Value Chain Map and Description of Market Actors

During the analysis of the CGI sheet value chain more than six interviews were conducted with market actors and key informants at sub-district markets and remote *char* areas. The primary actors in the CGI sheet value chain include the following:

- Dealers
- Retailers

### 7.5.1 Dealers

The dealers are agents of CGI sheet manufacturing company, and usually sell and supply CGI sheets at the retail level, and in a few cases, at the user level. There are no dealers of renowned CGI sheet companies at Galachipa bazaar but some of the large shop owners collect CGI sheets from distant dealers of manufacturing companies from Patuakhali and neighboring Jhalokathi and Lebukhali.

### 7.5.2 Large Sized Retailer

There are four large sized CGI sheet sellers at Galachipa sub-district. They sell directly to the users, as well as among the neighboring mainland and *char* CGI shop owners.

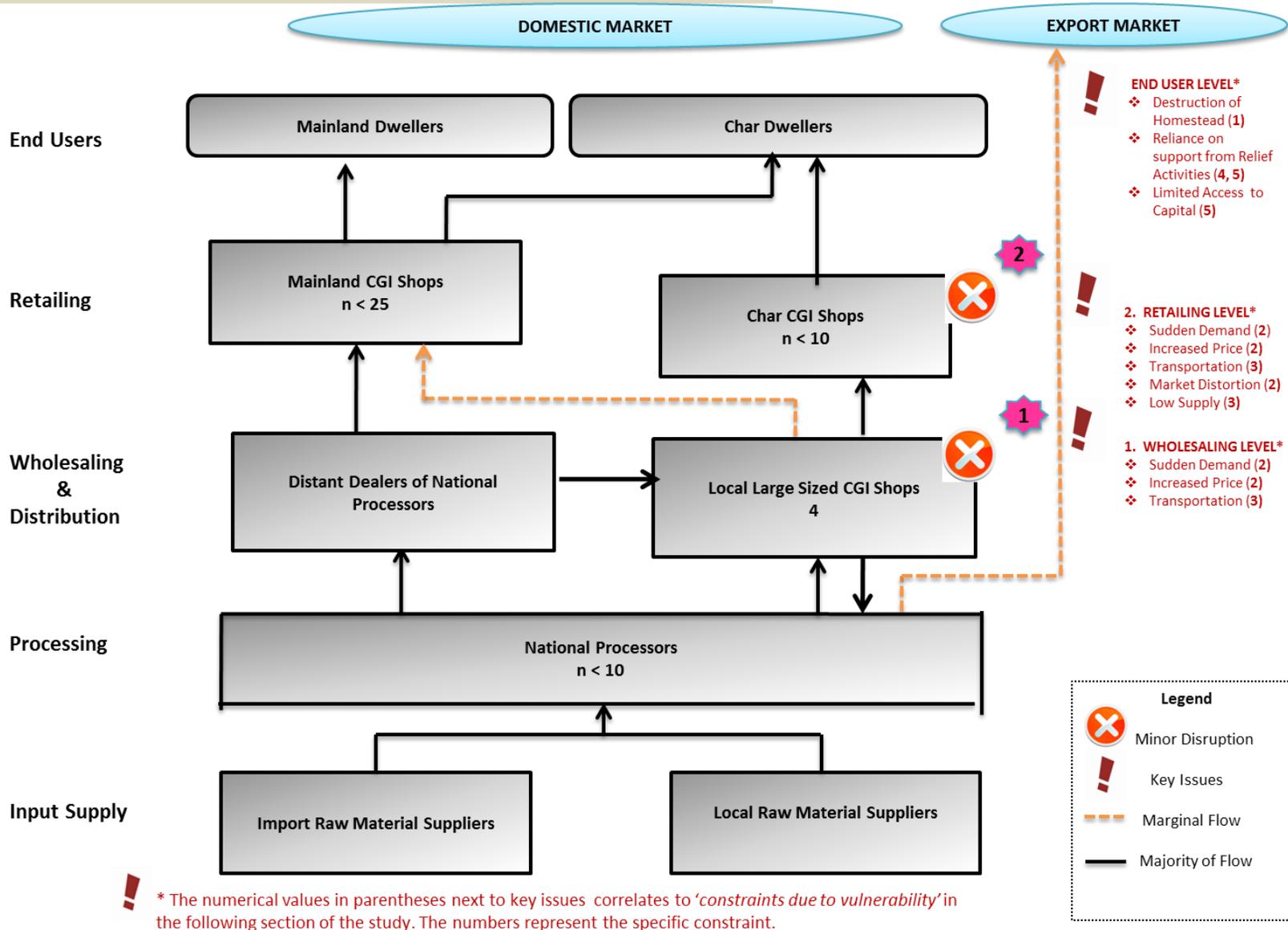
### 7.5.3 Mainland and *Char* Retailers

There are more than 25 CGI sheet shops at Galachipa sub-district mainland areas while there are less than 10 shops in *char* areas. They collect CGI sheets directly from distant dealers or local large sized shops and sell directly to users.

### 7.5.4 Supporting Market Actors

Supporting market actors include both public and private sector entities. Almost all of the rural *char* and mainland homesteads use CGI sheets for home construction since the price is affordable. Moreover, different development agencies as well as governmental departments distribute CGI sheet among the most vulnerable to rebuild their homes immediately after the severe cyclone. Financing for the CGI sheets is sourced from inhabitants' own means/or by microfinance organizations. There are construction workers or *mistris* who provide technical services for home repairs. Demand for their services increase significantly post cyclone, resulting in higher service charges.

## Galachipa Upazila, Patuakhali District: CGI Sheet



## 7.6 Constraints due to Vulnerabilities, Market Based Solutions, and Potential Facilitation Activities

A number of constraints due to vulnerabilities were identified in the CGI value chain. For each constraint, the team developed potential market-based solutions to the constraint and potential facilitation activities that development organizations may use to support market actors to develop and implement these market-based solutions. Constraints, market-based solutions, and potential facilitation activities can be found in the table below.

	Constraint due to vulnerability	Market-based Solution	Potential Facilitation Activities
1	Utilization of low priced CGI sheets, the preferred construction material of homeowners due to affordability, is easily destructible due to low quality, during times of strong winds or tidal surges, thereby increasing vulnerability of inhabitants.	Access to knowledge on structurally sound design of home construction for CGI users  Promotion of higher quality CGI sheets among inhabitants	Support construction workers to provide knowledge and information on how to utilize CGIs, and additional materials, to build a sound structural home construction that can better withstand natural disasters  Support CGI sellers to promote and market mid quality CGI sheets as a more durable building material option
2	Post disaster, at local levels, demand for CGI sheets increase resulting in a significant price increase. As a result, relief agencies source CGIs for rehabilitation efforts from distant markets, resulting in market distortion for local markets	Procurement of CGI sheet from local sellers	Support CGI sheet sellers in efforts to quicken the amount of time required to restock supply, increase existing stock, and coordinate with relief agencies for procurement from local sellers
3	Cyclones hamper normal supply of CGI sheets in the local market due to disrupted transportation, which results in lower sales for CGI sheet sellers	Access to regular transportation for stakeholders	Support boat/cargo owners to prepare a post disaster coordination plan, in order to collaborate in continuing an effective transportation system
4	Post disaster, a significant number of vulnerable beneficiaries do not receive relief support, while others in less vulnerable states, manipulate the system to attain relief materials, including CGIs,	Coordinate efforts in assessing needs of	Support relief and governmental agencies in coordinating efforts and communication to improve the selection of beneficiary process*

	free of charge	affected people	(*recognized as not a market-oriented approach)
5	Post disaster, limited access to capital results in a significant percentage of inhabitants relying on NGO support for reconstruction materials, which they may or may not be allotted.	Access to home finance for inhabitants	Support financial institutions (e.g. MFIs) to develop housing loans for reconstruction efforts

**A set of potential facilitation activities for the CGI sheet value chain include supporting:**

- construction workers in providing information to homeowners on how to construct structurally sound homesteads, using quality CGI sheets
- CGI sheet sellers in promoting durable sheets, increase existing stock of sheets, and increase awareness of relief agencies with regard to procurement from local sellers
- boat owners in improving transportation flow post disaster
- relief and governmental agencies in improving the selection of beneficiary process
- financial institutions (e.g. MFIs) to develop housing loans

**7.7 Implications for Relief and Recovery Efforts**

Given the importance of CGI sheets in the early stages of disaster relief, and the existing availability of CGIs in the local markets, humanitarian responders should coordinate with local sellers in efforts to quicken the amount of time required to restock supply, and increase existing stock.

## 8. DRY FOOD

### 8.1 Rationale for selection of Dry Food

The study team's preconceived notion was that in the immediate aftermath of such disasters, considerable relief response is required to reduce the suffering of those most affected, including the dissemination of dry food and clean drinking water. The importance of providing dry food to the most vulnerable was reiterated by nearly all officials engaged in relief and rehabilitation. Therefore, dry food, namely *muri*, *gur*, and *chira*, were selected as vital value chains worth considering for the study.



13 Muri Produced by Local Household Processors in Galachipa

However, upon careful analysis, our findings suggested that while dry food is essential in alleviating the suffering of those most affected, it is generally not available in the open market in Galachipa in times of disaster. Furthermore, minimal quantities of dry food are produced and sold locally in Galachipa, and due to the nature of the disasters, demand for dry food is less compared to demand for grains. Therefore, while the study team determined that dry foods are still essential recovery value chains worth considering, it also decided to peruse alternative recovery value chains, namely tube wells, which directly address the needs of inhabitants in times of disaster and assess the impact for potential market growth.

### 8.2 End Markets and Competitiveness

Dry foods such as *muri* (puffed rice), *chira* (flattened rice or beaten rice), and *gur* (molasses) are the three most commonly distributed food items from the government and NGOs post disaster, with an emphasis on the distribution of *chira*. Dry foods play a key component in relief efforts, particularly in areas where there are no cooking facilities.

The majority of dry foods in Galachipa are sourced from Dhaka, Jhalokati, and Khulna with minimal production conducted in Galachipa. Because the majority of dry food is not locally processed in

14 Gur in Pot



Galachipa, prices at the local market are high. *Muri* is the sole dry food produced locally in Galachipa, with a production cluster of 12-15 entrepreneurs, and a single entrepreneur produces 80 kgs per week, therefore a total production of 960-1,200 kgs per week, a relatively small amount. *Chira* is sourced from neighboring districts and Dhaka, and sold by five to seven local retailers. The total amount sold in Galachipa is also relatively small. *Gur* is readily sourced from Khulna and sold by six retailers in Galachipa with one mid-sized retailer selling between 320-430 kgs per week. Due to the minimal supply available in the local market, dry food is not particularly popular among

inhabitants in Galachipa. Additionally, dry food can be stored for only temporary amounts of time. For instance, *chira* can be stored for up to a month at most, and therefore, retailers do not have adequate stock in place to meet large spikes in demand.

### 8.3 Repercussion from Hazards

When a natural hazard is particularly catastrophic, resulting in large-scale destruction, dry food is significantly important as a means of relieving food scarcity. Typically, in Galachipa post severe disaster, the ‘most vulnerable’, meaning the ones most affected by the cyclone, require dry food. The selection of which beneficiary qualifies as ‘most vulnerable’ is determined by a selection process made primarily by the local government, and by some NGOs. Due to the biases encountered during the beneficiary selection process, some inhabitants who require significant relief, yet are not qualified by local authorities as officially ‘most vulnerable’, are overlooked and need to finance their own relief and rehabilitation activities, furthering existing economic pressures. Furthermore, during the initial stages of disaster, demand for dry food spikes as does the price, which results in increased economic pressure for the ‘most vulnerable’ who do not receive relief support. Prior to the impending disaster, inhabitants identified the best solution themselves, of digging up holes and storing a small portion of dry food in protective polythene plastic in the soil near their homesteads, so that they can consume it immediately post disaster. While this solution is sufficient for the majority of inhabitants in Galachipa, it is insufficient for those ‘most vulnerable’, who do not receive relief support, and require sizeable amounts of dry food post disaster.

Due to the nature of the storms, the majority of inhabitants, who do not endure waterlogging, can resume cooking post tidal surge which lasts nearly 5-6 hours. Once the tidal surge has subsided, inhabitants can go back to cooking. Alternatively, inhabitants bring cooking facilities with them on heightened embankments where they cook grains as temporary measures of nourishment. Thus, in Galachipa grains are often in higher demand for the majority of inhabitants than dry foods post disaster. However those inhabitants who reside in low lying areas, and endure waterlogging, due to tidal surges, require dry food as relief support, since cooking facilities are inundated with seawater, and mobility is challenging.

From the perspectives of a majority of consumers and retailers there is generally a sufficient amount of dry food on the market, even in times of disaster, with the exception of *gur*. The supply of *gur* was disrupted post cyclone Sidr for 15-30 days due to transportation issues resulting in a scarcity of *gur*. One retailer stated that 100 pots were sold out immediately after the cyclone, and he faced difficulty collecting the next round because the roads were blocked. Despite the relatively small amount of dry food in the local market, the majority of inhabitants are relatively disinterested in purchasing large amounts of dry food before disaster as there is no critical demand for sizeable amounts. Therefore, whether or not there are in fact sufficient amounts of dry food on the market, during disasters, is an insignificant factor to the majority of inhabitants in Galachipa.

Furthermore, pre-disaster, the local administration has an effective collaborative system in place among retailers to gather and distribute dry foods. The local administration collects available dry food, specifically *chira*, before a cyclone hits, for

15 Chira



emergency relief and rehabilitation support. For instance, prior to Sidr the local administration collected all locally and readily available *chira* directly from local retailers. As a result, five retail shops were able to gather 150-160 bags at 50 kg per bag and distribute it accordingly to the most vulnerable. If there is an additional need for supply post disaster it takes at most 2 days to source additional *chira* from Dhaka. The initiative taken by the local administration exhausts the supply of *chira* in the local market. However, the minimal availability of dry food pre and post disaster seems to have little impact on the majority of inhabitants because the majority of the ‘most vulnerable’ are tended to by the government. One trader however, mentioned that because the local administration purchases the entire local supply there is no availability for those who require *chira* for individual consumption. This is problematic because it can be assumed that those inhabitants who are indeed ‘most vulnerable,’ however, do not qualify as officially ‘most vulnerable,’ by local authorities or relief agencies, and therefore receive no relief support have no access to *chira* from the local market.



#### 8.4 Value Chain Map and Description of Market Actors

While conducting the analysis of dry food (*chira*, *muri*, *gur*) as recovery value chains, the study team conducted more than eight interviews with market actors and key informants. The study team has considered varying types of dry food, *chira*, *muri* and *gur*, in the analysis, however, carefully selected *chira* to be depicted in the mapping and description of market actors exercise. The analysis of *chira* will be beneficial as a means of comparing the *chira* value chain in the two hazardous regions preselected for the study, Kazipur and Galachipa. In Galachipa, *chira* is procured from neighboring areas, and not produced locally, which serves as a good point of comparison to Kazipur, which has ample local producers. Furthermore, in Galachipa, the initiative taken by the local governmental administration to collect and distribute dry food for the ‘most vulnerable’ during times of disaster, is focused on *chira*. Therefore the following primary actors in the *chira* value chain include:

- Input sellers
- Producers

- Retailers

#### **8.4.1 Input sellers**

The raw material suppliers for *chira* include paddy farmers, traders and necessary tool suppliers.

#### **8.4.2 Producers**

There are no local *chira* processors in Galachipa sub-district.

#### **8.4.3 Retailers**

The retailers collect *chira* from distant markets at Dhaka or Jhalokaathi. There are only four *chira* traders and between five to seven local mainland retailers. *Chira* can be stored for one month's time, at most, and therefore retailers have limited stock in storage. In times of disaster, the mainland retailers collaborate with the local administration to collect their complete supply of *chira* in stock for the local administration, who then distributes the dry food to the 'most vulnerable' through their beneficiary selection process.

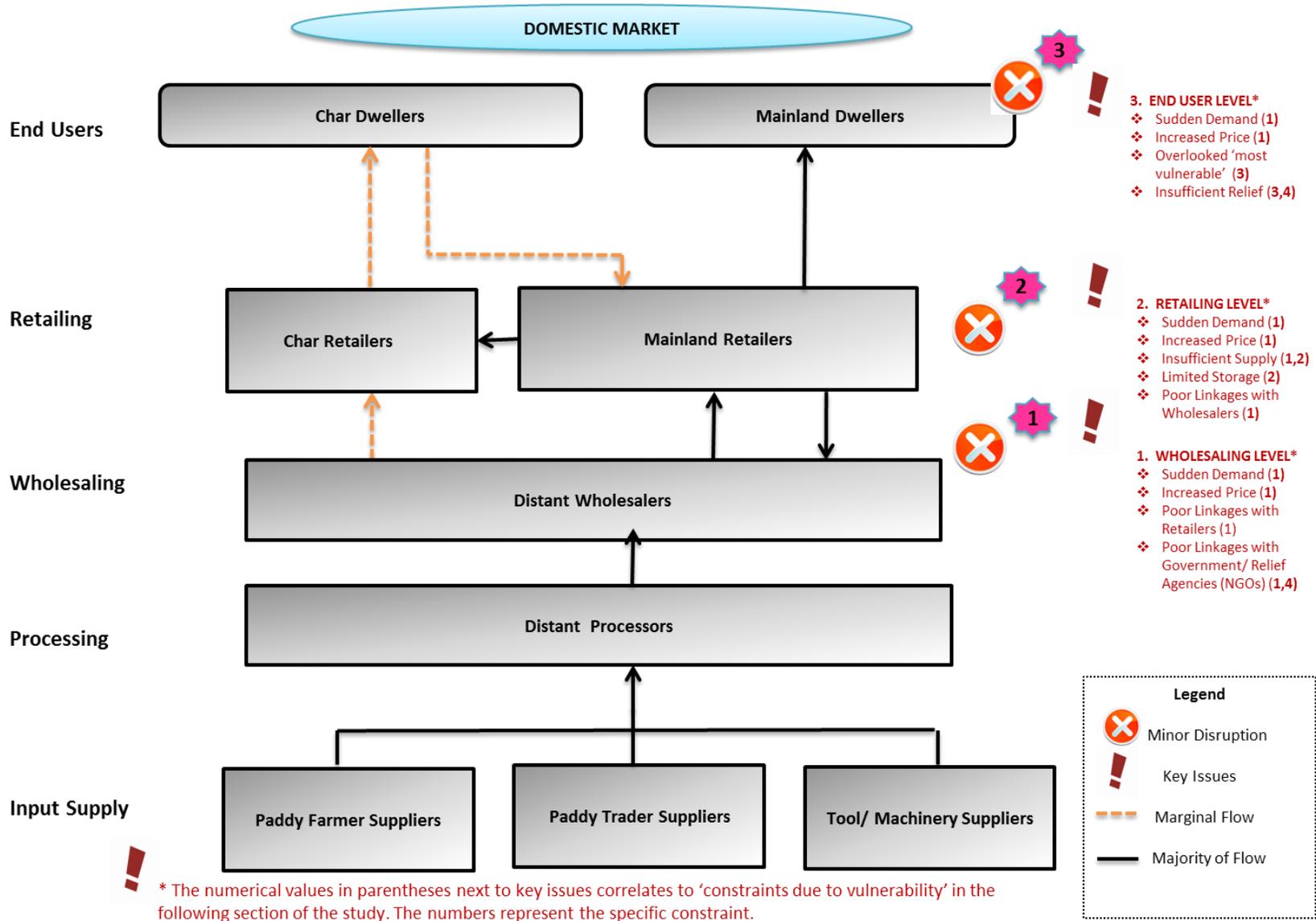
#### **8.4.4 Supporting market actors**

Supporting market actors include both private and public-sector entities that are not exclusively tied to the *chira* value chain. All levels of inputs for making *chira* are available at the local level, however there is no local processing.

#### **8.4.5 Enabling environment**

The local administration usually collects all local supplies of *chira* before a cyclone hits, for emergency relief and rehabilitation support. The purpose of the collection is to assure an adequate stock of *chira* for distribution, and to provide relief support immediately post disaster for the 'most vulnerable.' Therefore due to collaboration among the five to seven retailers, the government is able to collect their supply of *chira* in its entirety, approximately 150-160 bags of 50kg of *chira* per bag (in 2007), and distribute it to the 'most vulnerable'. This reduces the local supply of *chira* for the general population, as well as for those requiring dry food as relief support, yet overlooked by the government, during times of disaster.

## Galachipa Upazila, Patuakhali District: Dry Food *Chira*



### 8.5 Constraints due to Vulnerabilities, Market Based Solutions, and Potential Facilitation Activities

A number of constraints due to vulnerabilities were identified in the *chira* value chain. For each constraint, the team developed potential market-based solutions to the constraint and potential facilitation activities that development organizations may use to support market actors to develop and implement these market-based solutions. Constraints, market-based solutions, and potential facilitation activities can be found in the table below.

	CONSTRAINT DUE TO VULNERABILITY	MARKET BASED SOLUTION	POTENTIAL FACILITATION ACTIVITIES
1	In general, sales of <i>chira</i> are low in Galachipa, due to limited popularity and limited supply (only 5-7 retailers). In times of cyclone, there is increased sudden demand for <i>chira</i> , particularly from relief agencies (NGOs), however due to inadequate supply at local levels, as well as mass collection from the local administration for relief purposes, consumers and agencies cannot purchase <i>chira</i> from the open market for individual consumption and relief purposes.	Improve sourcing of <i>chira</i> for retailers and NGOs from different sources	Support <i>chira</i> retailers to develop improved storage facilities, and to improve their ability to manage inventory, particularly in times of severe disaster  Support <i>chira</i> retailers to source from regular and neighboring suppliers, particularly in times of signal/cyclone season  Support NGOs to develop systems to “pre-qualify” neighboring suppliers, with reasonable prices, and establish forward contracts for emergency supplies
2	<i>Chira</i> cannot be stored for a long duration of time, as quality decreases within one month, which results in poor stock of shop keepers.	Access to improved storage and inventory management for retailers	See #1 above
3	The selection process of the ‘most vulnerable’ by the local government may not capture all vulnerable households. Therefore, the list of beneficiaries selected for governmental relief support, including the distribution of dry food, inevitably leaves out names of inhabitants who require relief, however who were not selected to receive support.	Improve process of selecting beneficiaries for relief support	Advocate for local governmental administrations in collaboration with relief agencies (NGOs) to promote a “just” selection process*  (*recognized as not a market-oriented approach)
4	During times of disaster, the local administration	Promote diversification of sourcing	Advocate for the importance for

<p>exhausts the local supply of <i>chira</i> for distribution to the 'most vulnerable.' However, some in need of <i>chira</i> for relief measures do not receive support from governmental or relief agencies, and so therefore cannot purchase <i>chira</i> at the local market.</p>	<p>to allow for access to local <i>chira</i> market</p>	<p>local administration to diversify purchasing of <i>chira</i> for relief efforts from the local market as well as from neighboring markets to ensure a minimal availability of <i>chira</i> for those consumers requiring dry food, yet overlooked as 'selected beneficiaries</p> <p>Support governmental local administrations in sourcing from "pre-qualified" neighboring suppliers, as well as local suppliers</p>
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**A set of potential facilitation activities for the *chira* value chain includes supporting:**

- *chira* sellers to develop improved storage facilities, improve their ability to manage inventory, and ability to source from regular and neighboring sources particularly in times of signal/disaster
- NGOs and local retailers to develop systems to "pre-qualify" neighboring suppliers and establish forward contracts for emergency supplies
- governmental local administrations in diversifying sourcing in times of disaster from "pre-qualified" neighboring suppliers, as well as local suppliers
- local governmental administrations in collaboration with relief agencies (NGOs) to promote a "just" selection process

**8.6 Implications for Relief and Recovery Efforts**

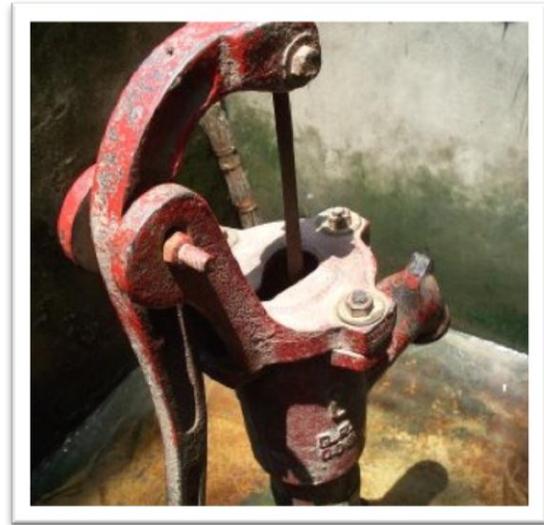
Given the importance of *chira* in the early stages of disaster relief, humanitarian responders should have a list of pre-qualified neighboring suppliers, so that they are immediately able to source and distribute *chira*.

## 9. TUBE WELLS

### 9.1 Rationale for selection of Tube Wells

As a result of the tidal surge and water logging tube wells are inundated with saltwater, resulting in the inaccessibility of clean drinking water for the overwhelming majority of Galachipa's inhabitants. Because clean drinking water is essential to life, and a person's survival depends on it, an analysis of the tube well value chain is fundamental for future recovery activities.

Despite the fact that the government plays the primary role with respect to tube wells in Galachipa, it is conceivable for local private sector tube well market actors to play larger supporting roles in minimizing health hazard risks during disasters, through complementary and maintenance services. Therefore, the analysis concerning tube wells is an analysis of the existing value chain, the focus on promoting the local tube well private sector, observations of the current roles of the private vs. public sector, and the investigation into what roles private actors can play to enhance the private sector.



16 Tube Well

### 9.2 End Markets and Competitiveness

Ample water sources are scarce in Galachipa, as achieving access to clean drinking water is arduous. Tube wells in Galachipa are extremely costly at 60,000-100,000 Tk per tube well including the labor cost amounting to 15,000 Tk. This price is attributable to the depth of 850-1,000 feet water table levels. Anything less deep has a high likelihood of having high iron levels and salinity in the water; therefore, it is a requirement to drill deep enough in order to access safe drinking water.

Because of the price and necessary labor involved, the government is primarily responsible for the installation and maintenance of the vast majority of tube wells in Galachipa. Currently there are 3,292 functioning tube wells in Galachipa of which 3,142 were installed by the government, and the remaining 150 tube wells were installed privately.<sup>28</sup> There are five to seven local private sector installers and two retail shops in Galachipa. Retail shops typically source necessary materials for tube well installation per order. Due to low demand for private tube well installation, local private installers work at the local level, as well as in partnership with private installers at the district level, as a means of earning more income. For installers, local level tube well installations and maintenance amounts to a small percentage of total business. Similarly, tube well inputs are a small percentage of sales for retailers, in comparison to other hardware materials.

The government instituted a selection process to assess where the installation of tube wells should take place. This process is primarily based on the demand of inhabitants, at least 10 families must utilize the tube well consistently, beneficiaries must pay 5,000 Tk per tube well, and the tube well should be centrally located. Once selected, the Public Health Engineering Department installs tube wells on selected areas with raised land to protect the tube wells from water logging. Additionally, the government is responsible for regular maintenance of the tube wells as well as relief measures post disaster.

<sup>28</sup> Interview with local Public Health and Engineer Department

### 9.3 Repercussions from Hazards

The primary issue post hazard is water scarcity, as nearly all tube wells are inundated with saltwater post disaster. Post cyclone, saline water contaminates tube wells, and the lack of clean drinking water exacerbates health hazards such as waterborne diseases. As a result of the tidal surge, clean drinking water cannot be accessed for 5-6 hours, but once the surge recedes, an attempt to recover clean drinking water begins. Based on the severity of the disaster, tube wells can be completely destroyed which results in tremendous financial loss for the government. Some locations in Galachipa experience water logging up to eight feet high which makes tube wells completely inaccessible. In 2009, post cyclone Aila, nearly all tube wells in Galachipa were inundated with saline water.

Therefore, as a temporary solution, inhabitants collect water from neighboring communities with lower levels of water logging and elevated tube wells. Accessing elevated tube wells can be problematic as they can be located one to two kilometers away. Support from the government and relief agencies is provided, including the dissemination of bottled water, purifying tablets, as well as plastic cans used for retrieving water from neighboring sources. After a severe disaster, the region is dependent on external support for safe drinking water for 48 hours to one week. However, soon after the disaster the Public Health and Engineering District Level is capable of providing services for victims.

There are varying approaches and opinions as to how to best access and ensure clean drinking water post disaster: the reactive solution recommended by governmental agencies, and the preventative solution recommended by the NGO sector.

**The Reactive Approach:** Once a cyclone hits, the government takes responsibility to provide mechanics to repair tube wells. They utilize a mechanical pump for three to four hours to extract the salinity, as well as bleaching powder, until levels of water are safe. While this approach has proven to be effective, it requires ample technically skilled man power. Additionally, this approach allows for the potential of tube well heads to be extracted by high winds, resulting in irreparable tube well damage. Inhabitants reiterated that those homesteads located in more isolated areas remain highly vulnerable post disaster because tube wells are not repaired, and there is no access to safe drinking water. Therefore, various NGOs have perused alternative solutions in order to prevent the inundation of salt water.

**The Preventative Approach:** Our study team found that various suggestions have been made as to how to best prevent contamination of salt water during disasters, and how to readily access clean drinking water immediately after the surge recedes. The primary preventative solutions discussed during our field visit were the utilization of 1) plastic wrap, 2) an iron or plastic cap, and 3) the raising of pipe.

**Plastic Wrap:** One suggestion made by an NGO, was prior to a cyclone, to take the tube well's head off in order to prevent it from being destroyed and swept to sea by debris during the tidal surge and to cover the top portion of the piping with a polythene plastic wrap or a plastic cover in order to prevent saline water from entering the spout. The message was widely disseminated to community members. For instance, *char* community members mentioned that they heard, by word of mouth and through leaflets, of such a solution, however had not yet seen a demonstration, and did not have the technical knowhow necessary to perform this practice.<sup>29</sup>

However, the district level Public Health Engineering Department refutes this suggestion, stating that plastic is not a durable material, and it is preferable to keep the head of the tube well on

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<sup>29</sup> Interview with *char* inhabitants, 2012

during disasters to minimize the amount of water that can accidentally enter. They went on to suggest that if by chance the plastic material was unintentionally removed, there's a high risk for salt and dirt to enter the tube well, which would make the tube well irreparable. Furthermore, a tube well's head weighs 35kg, and therefore, if individuals were to disassemble the head, there is a high likelihood that in time of disaster, due to lack of storage at one's homestead, and high winds, the tube well head could be lost or swept to sea.

**Plastic Cap or Iron Cap:** Another suggestion also made by an NGO was similar in theory, to take the tube well's head off, and close the top portion of the upper pipe with a plastic cap. The NGO supporting the approach to use a plastic cap asserts that the plastic cap device is available on the market, while the Public Health Engineering Department suggests that no such cap exists on the market. However, upon further investigation, the study team was unable to find a plastic cap in the market, but was able to find a sturdier alternative, an iron cap.

The iron cap, although not commonly used as a preventative measure in terms of disaster, appeared to be a feasible solution. Tube well installers who have the technical knowledge of what mechanisms could be used in times of disaster to secure the clean drinking water of tube wells encouraged the use of the iron cap.

Additionally, the Public Health and Engineering Department, agree that the iron cap is a viable solution, however, has never been considered due to a lack of awareness, and perception that the cap has an alternative product use. The iron cap is 1.5 inches in length and costs 75 Tk. A wrench is required in order to install the iron cap on the pipe, which is commonly owned by homesteads in Galachipa. The solution can be easily implemented by a community member and does not require technical skills, although a demonstration is necessary. The Public Health and Engineering



17 Iron Cap

Department preferred this solution, as the material is far more durable, however still maintains the high risk of finding suitable storage for the head of the tube well. Typical use of the iron cap is as a temporary cover, when a damaged tube well head is being repaired.

**Raising Pipe with socket:** An additional solution discussed was the installation of additional piping in order to raise the tube well head above flooding levels, in locations where water logging occurs. It was determined that an additional two feet of pipe is the necessary height requirement, and with proper installation is a viable solution. Currently, in times of disaster, arrangements are made to procure additional piping, as well as ensure that mechanics are readily available on standby to repair tube wells. This solution does not require technical training, however does require orientation through demonstration, because improper installation could result in great damage.

The study team observed that there was a lack of coordinated information among the governmental and NGO actors. For instance, a solution for accessing clean drinking water that one NGO was widely promoting was in direct contradiction to what the Public Health and Engineering Department was



18 Additional Extension Piping for Tube Wells

advocating for. As a result, there are mixed messages regarding how to best deal with tube wells post disaster among community members. Similarly, with regards to the ‘preventive approach’ of securing tube wells pre disaster, there are variances in belief as to what would be the most effective approach, and little empirical evidence as to which solution would be most effective .

The following chart assesses the different methods of ‘preventative approaches’ discussed to protect tube wells from salinity inundation during disaster. This figure can be used as a tool to compare the varying suggestions. Our findings propose that the ‘iron cap’ and ‘raising of pipe’ methods are feasible and effective approaches for minimizing risk among the discussed suggestions. The risk in implementing the ‘iron cap’ solution is that it requires keeping the tube well head off, and therefore high risk for losing the head, due to limited storage and high winds. However, after conducting a cost-benefit analysis, it was determined that the cost of repurchasing a head at 3,000-4,000 Tk with minimal labor costs for installation, is significantly less compared to the cost involved in having to reinstall a new tube well at the price of 60,000-100,000 Tk. Therefore, even with the risk involved, the ‘iron cap’ solution is still viable. However, such solutions require the backing of empirical data, and the concerted effort of relevant

actors to collaborate in orienting inhabitants towards implementing new methods of securing safe drinking water.

Figure 4: Comparison between Varying ‘Preventative Approaches’ for Ways to Protect Tube Wells from Salinity

SIGNIFICANT FACTORS	‘Preventative Approaches’ to Protecting Tube Wells from Salinity			
	Plastic Wrap	Plastic Cap	Iron Cap	Raising Pipe
Requires Keeping Tube Well Head Off	✓	✓	✓	✗
Durable Material	✗	✗	✓	✓
High Risk	✓	✓	✗	✗
Requires Technical Support	✗	✗	✗	✗
Requires Orientation through Demonstration	✓	✓	✓	✓
Supported by Public Health Engineering Department	✗	✗	✓	✓
Materials available at Local Market	✓	✗	✓	✓

### **Role of Private Sector:**

Due to governmental limitations, such as funding, efficiency, man power, etc., the private sector tube well actors can play a larger role in servicing and maintenance of tube wells. The private sector is equipped in skill and efficiency to provide necessary services, particularly to those in need post disaster in low lying and remote areas. The demand for services to be performed in a productive, time efficient manner is evident from the needs and constraints vocalized by inhabitants. Inhabitants are willing to pay a fee for service for prompt reparation, and consistent maintenance of tube wells, therefore, the private sector can play a vital role in filling this gap. Service providers can take active roles in implementing 'preventative approaches' to minimize salinity contamination, improving existing maintenance services, and acting as contract installers to meet demand of NGOs and governmental agencies. Such services are intended to be ways of enhancing the service line of the tube well division in their existing businesses. Furthermore, the private sector can determine whether there are additional business opportunities for the potential growth of the tube well industry in the region such as irrigation or crop cultivation.

## **9.4 Value Chain Map and Description of Market Actors**

During the analysis of the tube well value chain more than seven interviews were conducted with market actors and key informants at the district headquarter and remote *char* areas. The primary actors in the tube well value chain include the following:

- Input Suppliers
- Wholesalers
- Retailers
- Installers and Maintenance

As seen in the value chain map in the following section, several market actors may take on a number of different functions.

### **9.4.1 Input Suppliers**

Mostly, tube well manufacturing companies are the main suppliers of the tube well head, pipe and related accessories through their distribution channel countrywide. There are two hardware shops at Galachipa market supplying input and raw materials for tube wells. However, bulk volume of inputs and raw materials are generally collected from distant hardware shops.

### **9.4.2 Wholesalers**

There are no wholesalers of tube well accessories at Galachipa but at Patuakhali District level there are two to three wholesalers. They typically collect raw materials from manufacturing companies based on buyers' demand and requirement.

### **9.4.3 Installers and Maintenance**

#### **Government Public Health Engineering Department Installers**

The Public Health Engineering Department (DPHE) is the main actor supplying subsidized tube wells in varying communities in Galachipa Upazila. This upazila's office receives allocation from the district level, and generally distributes allotted tube wells through the local union *parishad*. The department has three to four expert mechanics to install as well as provide maintenance services for tube wells.

#### **NGO Supported Contract Installers**

NGOs purchase bulk amounts of tube wells from distant markets, and distribute them at community levels, under their program support. In most cases, the installers come from distant areas, and these installers hire local installers to assist them during installation.

#### **Private Sector Installers**

Since tube wells are highly costly, a small percentage of people privately install tube wells for individual use. There are five to seven private installers to provide services during the time of installation.

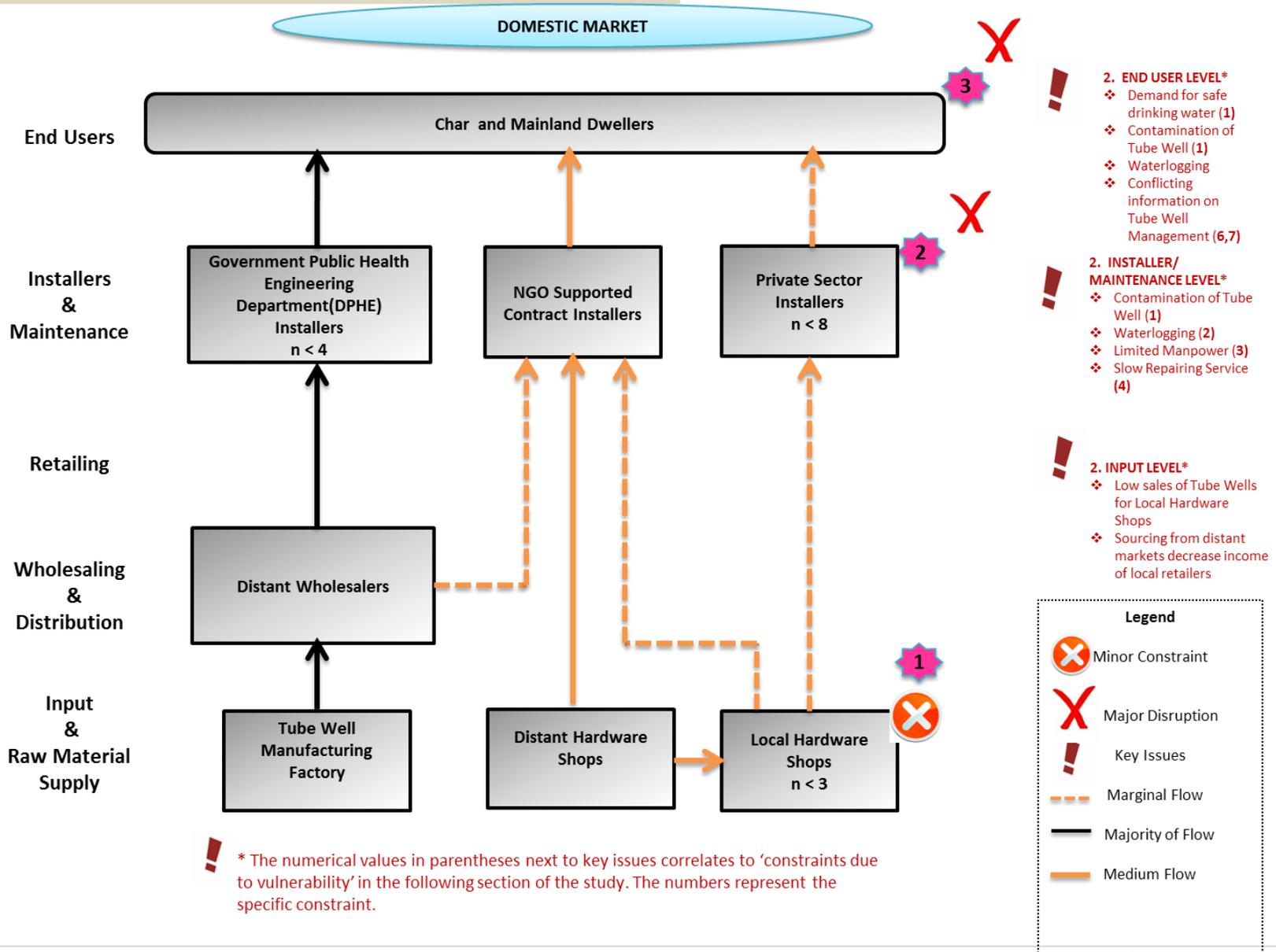
#### **9.4.4 Supporting market actors**

Supporting market actors include both public and private sector entities that are exclusively tied to the tube well value chain. Mostly, the Government Public Health Engineering Department (DPHE) as well as NGOs, provide support for installation of tube wells in the *char* and main land areas. The local union *parishad* provides support in selecting eligible beneficiaries and communities for installation of tube wells. DPHE distributes a majority of supplies, as well as provides technicians who provide support for maintenance. Their technicians provide support for cleaning and repairing services post disasters, and sometimes also hire local installers to assist them.

#### **9.4.5 Enabling environment**

The subsidized cost for tube wells encourages accountability, with support services from the Public Health Engineering Department, or from donor funded projects. During cyclones there is high risk of damage to tube wells and contamination of safe drinking water. Inhabitants as well as governmental technicians take primary roles in cleaning and extending repair services. Even though DPHE deploys additional technicians from other regions, to expedite services post disaster; there is still room to increase efficiency and utilize services of private technicians at the community level.

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## 9.5 Constraints due to Vulnerabilities, Market Based Solutions, and Potential Facilitation Activities

A number of constraints due to vulnerabilities were identified in the tube well value chain. For each constraint, the team developed potential market-based solutions to the constraint and potential facilitation activities that development organizations may use to support market actors to develop and implement these market-based solutions. Constraints, market-based solutions, and potential facilitation activities can be found in the table below.

	CONSTRAINT DUE TO VULNERABILITY	MARKET BASED SOLUTION	POTENTIAL FACILITATION ACTIVITIES
1	<p>Nearly all tube wells are inundated with salinity post severe disaster, resulting in the scarcity of clean drinking water for inhabitants of Galachipa</p>	<p>Increase access to 'preventative approaches' and maintenance of tube wells for inhabitants</p>	<p>Train local private sector tube well service providers and retailers in effective 'preventative approaches'</p> <p>Support local private sector tube well service providers in promoting and providing orientation through demonstration of effective 'preventative approaches' to inhabitants</p> <p>Support local private sector tube well service providers in providing maintenance services for fee for service post disaster</p> <p>Support local private sector tube well retailers in supplying necessary materials (i.e piping, socket, iron cap) for 'preventative approaches'</p>
2	<p>Post tidal surge, some locations in Galachipa experience water logging which makes tube wells completely inaccessible in specific areas. Accessing elevated tube wells can be problematic as they can be located one to two kilometers away, resulting in scarcity of clean drinking water for inhabitants in low lying areas.</p>	<p>Increase access to 'preventative approach' of raising pipes of tube wells for inhabitants of low lying areas</p>	<p>Support local private sector tube well service providers in providing orientation through demonstrating of raising pipe approach in pre identified low lying areas</p>

3	Reactive approaches, taken by the government to desalinate tube wells post disaster until levels of water are safe are effective; however require ample technically skilled man power. Due to the limited number of governmental mechanics, reparations take long durations of time to complete resulting in scarcity of clean drinking water for inhabitants.	See # 1 above	See #1 above
4	Homesteads located in more isolated areas remain highly vulnerable post disaster because tube wells are not repaired promptly, resulting in no access to safe drinking water resulting in a financial loss for tube well owners.	See # 1 above	See #1 above
5	Due to lack of storage at one's homestead, and high winds, the tube well head could be lost or swept to sea, particularly when implementing a 'preventative approach'	Improve access to tube well storage and management	Support tube well service providers, NGOs and governmental agencies in providing orientation through demonstration of storage and tube well management during disaster
6	The study team observed that there was a lack of coordinated information among the governmental and NGO actors for which 'preventative approach' is most effective resulting in misinformation and confusion among inhabitants.	Improve collaboration between NGO and governmental actors	Support NGOs and governmental actors in improving communication and collaborating to determine 'best practices' for tube well management pre/post disaster
7	There is little empirical evidence as to which 'preventative approach' solution to minimize tube well risk would be most effective	Determine empirical evidence for effective 'preventative approach'	Support NGOs and governmental agencies in conducting studies/experiments to determine effective 'preventative approaches'  See # 6 above  See # 6 above

**A set of potential facilitation activities for the tube well value chain includes supporting:**

- the collaboration of NGOs, governmental agencies, and the private sector in determining effective 'preventative approaches' to minimize risk of salinity contamination
- development of private sector tube well service providers and retailers by

1. Training service providers and retailers in effective 'preventative approaches' to minimize salinity contamination
2. Supporting service providers in providing demonstrations of 'preventative approaches'
3. Supporting service providers in improving maintenance services for fee for service
4. Supporting retailers in supplying necessary hardware required for 'preventative approaches'
5. Supporting service providers in tending to tube wells needs of those residing in low lying and remote areas for fee for service

### **9.6 Implications for Relief and Recovery Efforts**

Due to the critical role of safe drinking water in maintaining health, relief agencies can promote effective 'preventative approaches' through market actors to minimize risk of salinity contamination. Efforts should particularly be focused on servicing the needs of inhabitants residing in low lying and remote areas

## CONCLUSION

Action for Enterprise's findings determine that there is significant scope to apply market-oriented approaches to DRR programs in Galachipa. These approaches have the potential to generate a number of improvements over traditional DRR and relief approaches currently being implementing. Utilizing these approaches will undoubtedly generate additional benefits for the poor including increased sustainability of economic gains, reduced vulnerability from natural hazards such as cyclones and floods, and improved targeting of relief efforts in the event of disasters. As determined by the various market based-DRR solutions, the implementation of 'potential facilitation activities' will address the specific constraints of market actors specific to Galachipa and enhance existing relief and rehabilitation efforts. Furthermore, the results of these and similar value chain analyses can play an important role in helping relief and early recovery efforts to strengthen the market systems in which the 'most vulnerable' operate.