

VULNERABILITY AND COPING STRATEGY OF FEMALE-HEADED HOUSEHOLDS IN A WATERLOGGED AREA OF BANGLADESH

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Abstract

Waterlogging is a common hazard in low-lying countries over the world. Some part of Bangladesh is more vulnerable to waterlogging due to geographical settings, climate change and other anthropogenic factors. The present study aims to assess the vulnerability and coping strategy of Female-Headed Households (FHHs) in the waterlogged area of the south-western part of Bangladesh. The study was conducted among the female-headed households from the seasonally waterlogged area in Joynagar Union under Kalaroa Upazila of Satkhira District. Three mauzas, a local land revenue area, were selected from Joynagar union. Total 71 female-headed households were identified during the study. The study found that female-headed households are facing a threat of extreme poverty due to the loss of income and damages of crops by waterlogging. Consequently, their vulnerability is increasing significantly because of direct and indirect impacts of current flooding. The community has been trying to cope up with waterlogging by changing their food habits and income sources, as well as taking micro-credit. The findings of the study can be used by policymakers and administrators to develop the effective coping strategies for female-headed households.

Keywords: *Waterlogged area; Female-headed household; Livelihood; Vulnerability; Coping strategy*

Introduction

Waterlogging is a common hazard in most low-lying countries over the world (Sundaram *et al.* 2004). Bangladesh is known as a hazard-prone country because of its geographical location and the physiographic conditions. The country is vulnerable to natural hazards like flood, cyclonic storm surge, drought, salinity intrusion, coastal and river bank erosion (Ali 1996; Haque 1997; Ahmed and Mirza 2000). The country is located in Ganges, Brahmaputra and Meghna floodplains which make flood as the most common hazard and a natural part of the life cycle of its inhabitants. The coastal peoples of Bangladesh are more vulnerable to flood caused by tidal surge. In the 1960s, systematic development of large-scale embankments for flood control through Coastal Embankment Project (CEP) was started. About 4,000 km coastal embankment

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was built under different projects for protecting the vulnerable coastal peoples from flooding consequences (Rahman 1995; Tawhid 2004; Moniruzzaman 2012). However, embankment is not working as flood control measure because of hydro geophysical setting in many cases of south-west Bangladesh. The geomorphological features of south-west coastal areas of Bangladesh were impacted by commissioning of embankment under CEP and Farakka Barrage (commissioned in 1975) which created a new adverse phenomenon called as ‘waterlogging’ (Rahman 1995; DHV-WARPO 2000; Sarker 2004).

The waterlogged situation is a new phenomenon which has been disrupting livelihoods of about one million people of south-western coastal Bangladesh since few decades (Islam *et al.* 2004; Ahmed *et al.* 2007). The combined effect of higher sea water levels, subsidence, and siltation of estuary branches, riverbed levels and reduced sedimentation in flood protected areas will be impeded drainage and gradually increase waterlogging problems which causing difficulties for the affected people (Rahman 1995; Ali 1996; Ahmed *et al.* 1998). The problem has become severe in the south-western parts of Bangladesh, especially along the Kobadak River system covering parts of Jessore, Khulna and Satkhira Districts. The people of Satkhira, Khulna and Jessore are seriously affected by waterlogging from late July, which is really indescribable. Instead of improving the situation, in recent year waterlogging has been extended to Kalaroa, Jhikorgachha and Sharsha. The incessant raining has created an extreme and extensive high inhumanities situation over the areas. The affected villages were under water with houses, livestock and other assets including field and homestead crops (UNDP 2011; Concern Worldwide *et al.* 2011). Gradual siltation on the riverbed of Kobadak, triggered by inadequate runoffs in the southern reach caused by coastal embankment project, is the main source of the problem. The low-lying areas along the Kobadak River inundated between June and November in every year. There are areas, where people are compelled to live in waterlogged condition for even nine months a year (Neelormi *et al.* 2009).

Few studies assessed or investigated livelihood pattern of wetland community or waterlogged areas of south-west region of Bangladesh (Rejve 2006; Mahzabin 2006; Adri 2009; Hossain 2010; Awal 2014). Some studies have identified the vulnerability and coping strategy or local/indigenous adaptation policy/technology of the waterlogged people of south-west Bangladesh. Some other studies also identified the causes and effect of waterlogging in the urban area as well as impacts of waterlogging on ecosystem due to commissioning of the embankment (Tawhid 2004; Rahman and Debnath 2015).

Rural Bangladeshi women are regarded as poorest of the poor because they are economically poor, socially prejudiced by customs and beliefs, and traditionally secluded in *pardah* (special system for Muslim women) due to the patriarchal dominance of the society. However, only a few study found addressing the impacts and adaptation to climate change or manmade induced

Vulnerability and coping strategy of female-headed households

waterlogging for women (Ahmed *et al.* 2007; Adri 2009). But, the authors could not find available studies focusing on vulnerability and coping strategy of female-headed households in waterlogged condition whereas literatures show there are more than 15 percent of the rural households in Bangladesh are headed by women. These households can be found in the marginalized group in our society and are more vulnerable to any natural calamities (Mannan 2000). Therefore, it is high time to identify the female headed household's (FHH) present vulnerability to waterlogging and their relevant coping strategies. Hence, the present study aimed to assess the vulnerability and coping strategy of Female Headed Households (FHHs) in the waterlogged area of the south-western part of Bangladesh. Specific objectives of the study are – (1) to assess the socio-economic characteristics of the FHHs; (2) to figure out the vulnerable condition of the FHHs during waterlogged and normal condition; and (3) to explore the coping strategy practiced by FHHs in the study area.

Working Definition

Waterlogging

Geographic flooding area within the embankments where water remains stagnant for longtime because of narrow drainage pattern or drying river caused by hydro-geophysical factors (Adri and Islam 2010).

Female-headed household

The de-facto head and de-jure especially widowed, divorced and abandoned women, the illness of a spouse or his migration to abroad to find work and women perform the functions of socialization and economic subsistence for the household and difficulty in coping with them and who is responsible for the daily needs of a household (Nizamuddin *et al.* 2001).

Vulnerability

The characteristics of a person or group and their situation that influence their capacity to anticipate, cope with, resist and recover from the impact of a hazard (Adri and Islam 2010).

Coping strategy

The ways and means a community, household, or an individual, uses to recover from the effects of shock that may be financial ability or environmental-social context (Rahman *et al.* 2009; Adri and Islam 2010).

Theoretical Framework

Vulnerability assessment

Different researchers used different frameworks to assess the vulnerability of a particular event. Some used access to assets, power, information and knowledge as the vulnerability assessment

indicators while some identified measurements of poverty incidence, inequality and institutional settings as proxy indicators to assess the vulnerability (Watts and Bohle 1993; Adger et al. 2003). In addition, a more integrated framework encompassing both biophysical components (exposure and sensitivity) and the socio-economic component (adaptive capacity) has been followed some researcher (Gbetibouo and Ringler 2009; Nelson et al. 2010). In the context of waterlogging, agriculture, drinking water, livelihood pattern, housing, sanitation, education, health etc. were identified as the vulnerability assessment indicator (Adri and Islam 2010). The authors of the present study used the following framework and assessed the vulnerability of waterlogging of the study area (Figure 1).

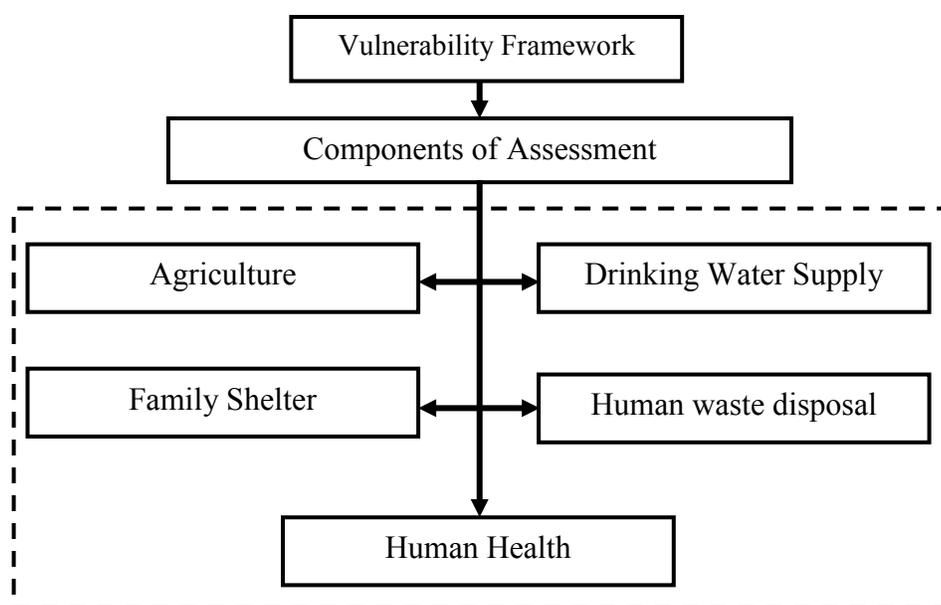


Figure1. Vulnerability framework based on existing literature.

Coping strategy assessment

Several studies identified different types of coping strategy like structural modification, food adjustment, change agricultural system, reduction in health and educational expenditure, diversification of livelihoods, savings, seasonal migration, sale of wage in advance, sale of assets to cope up with different types of hazards such as waterlogging, flood, cyclone, climate change etc. (Haque and Zaman 1993; Del Ninno et al. 2003; Kabir 2009; Adri and Islam 2010). The present research used following components (based on pilot survey) in order to assess coping strategy of female-headed households in the study area:

- Structural development
- Livelihood coping
- Agricultural and food coping

- Drinking water coping
- Institutional initiatives to cope up with waterlogging.

Material and Methods

Study area

The waterlogged areas are primarily identified based on reviewing several secondary literatures. The scale of the waterlogged and its impacts are significant in Satkhira district, Bangladesh. According to the UNDP report (2011), 80 to 100percent areas of ten unions in Satkhira district were severely affected by waterlogging. The Joynagar union of Kalaroa Upazila in Satkhira district was selected as a study area because it was also one of worst affected union by waterlogging in 2011. The study area is situated 22°49'30" North to 22°52'56" North latitude and 89°5'35" East to 89°8'11" East longitude. The Kobadak River is bounded on east, Jallabad union in the west, in the north Jugikhali union and in the south Dhandia union. The area consists of nine *mouzas* (a type of specific land area within which there may be one or more settlements) and these are mostly affected by seasonal waterlogging (MoL 2011). Amongst them, three mouzas (Figure 2) were randomly (using lottery method) selected (Varalakshmi *et al.* 2005) to conduct the study. Total households of the union are 3,564 which consist of 14,144 populations including 6,919 male and 7,225 female. Total land area of the union is about 4,061 acres which indicate that the population density is about 981 per square km (BBS 2011).

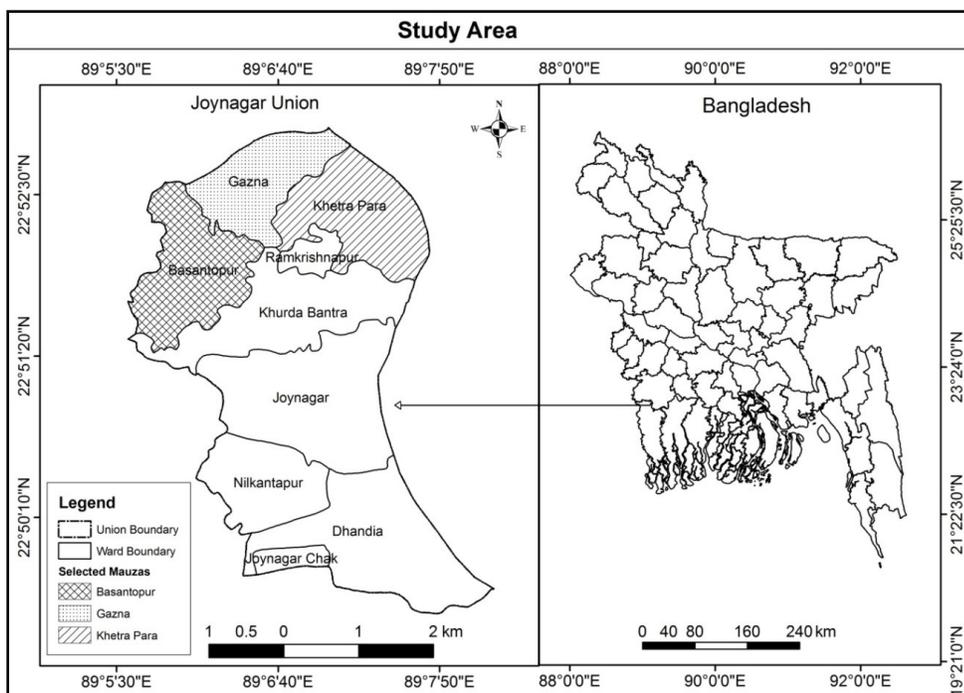


Figure 2. Location of study area

Data collection and processing

The research encompasses primary and secondary data. Primary data were collected through field survey in 2013 using relevant tools and techniques like direct field observation, questionnaire survey, group discussion and official documents. There are total 1381 households in the selected three mauzas (study area) of which total 71 households (14 in Basantapur *mauza*, 28 in Gazna *mauza* and 29 in Khetra Para *mauza*) were found as female-headed household (FHH). Global Positioning System (GPS) was used for collecting spatial data of the selected households (Figure 3). Before questionnaire survey, six pilot questionnaires were tested in three *mauzas* (two in each *mauza*) to find out whether the questions in the structured questionnaires were realistic, acceptable among affected households or not. After completing pre-test, essential corrections were performed and final questionnaire was prepared. Official information, raw data, documents were collected from the union office and other relevant offices of the Upazila administration. Secondary data were collected from published documents relating research objectives from Government, NGOs, and INGOs offices. Secondary data also collected from several books, journals, theses, reports and internet sources to supplement the primary data.

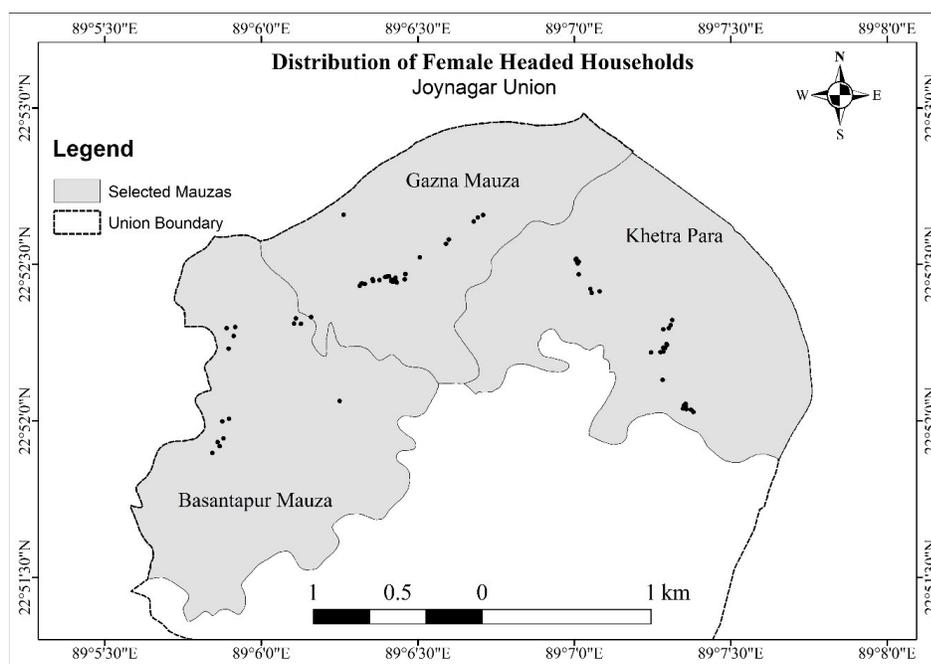


Figure 3. Female headed households in the study area

Data was corrected two times during field work and prior to data processing. Before data entry, answers of questions have been coded as numeric or string. Some questions were pre-coded, and some were post coded. After coding, data entry and analyses have done using SPSS Statistics

17.0 software. All of the maps were produced using ArcGIS 10 software using the collected spatial data.

Results and Discussion

Socio-economic characteristics of household

Total numbers of surveyed households were 71 consisting of 212 family members including 32 percent male and 68 percent female belongs in single (87 percent) and joint (13 percent) families. The average number of family member was three and age was 25 years. The median age was 24, whereas minimum age was one and maximum 75. Considering marital status, almost 41 percent family members were in under age (less than 21 years for male and 18 years for female as per government policy), 32.5 percent married and only 7.1 percent unmarried while 15.1 percent widow/widower and 4.2 percent divorced women. Figure 4 shows sex wise education status of 183 family members including male (N=54) and female (N=129) and excluding child those age below 6 years.

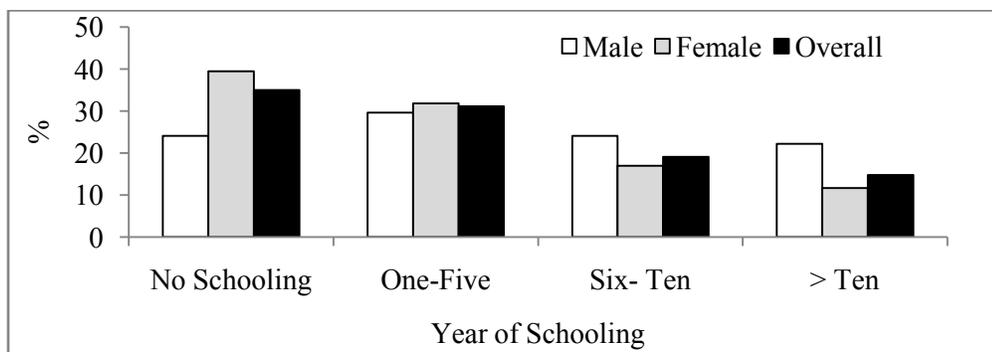


Figure 4. Education status of the family members

Average monthly income of the household was BDT 5,618 and minimum-maximum was BDT 800 and 15,000, successively. It is highly noted that about 81.6 percent income comes from foreign remittance (40.8 percent) and day labour (40.8 percent).

Socio-economic characteristics of household heads

There were total 71 female headed households in the studied three *mauzas* of the selected union. Average age of the household heads was about 40 years while median 38 years, minimum 20 years and maximum 70 years. Most of them were found married (47 percent) while about 41 percent was widow and 13 percent was divorced. About 54.9 percent didn't attain in school while about 18.3 percent attained in class one to five while 15.5 percent attained in class six to ten and 11.3 percent passed SSC or Dakhil. Significant percent household head (52 percent) were housewife and rest of was economically active. Amongst the economically active household

heads, most of found as day labourer (79.41 percent), about 8.82 was farmer, 5.88 was service holder, 2.94 was small business holder and 2.94 was found as bagger.

Waterlogging as a major phenomenon

All the low-lying areas including Joynagar union along the Kobadak River are usually inundated between June and November. Since 2002, people of this area have been suffering six to nine months waterlogging as a major phenomenon. Figure 5 shows the extent of waterlogging in 2012 based on the local people's perception. The affected villages went under water and maximum 5 feet water level observed in the study area. Table 1 presents statistics of water level during waterlogging in the study area which was prepared based on the opinion of interviewed respondents.

Table 1. Water level during waterlogging in the study area

Statistics	Water level in feet (N=71)	
	Waterlogged in 2012	Maximum in the study area
Mean	2.50	3.48
Median	2.50	3.00
Minimum	1.00	2.00
Maximum	4.00	5.00

Waterlogging does not occur due to only the geographical position but also human interventions worked as a major culprit responsible for this unwanted phenomenon. Considering multiple answers, drying of river (71.8 percent) is the leading cause of waterlogging in the study area. On the other hand, 62 percent respondents opined that narrow drainage pattern is the main cause and 40.8 percent opined construction of embankment is one of the causes, while only 1.4 percent stated construction of Farakka Dam by India is the main cause of waterlogging in the study area.

Vulnerability of FHHs due to waterlogging

The vulnerability of FHH was assessed in terms of agriculture, drinking water supply, human waste disposal, family shelter, and human health.

Agriculture

Waterlogging makes female headed-household vulnerable or helpless because it reduces or submerged their agricultural land for about six to nine months. This study found that 2012 waterlogged reduce crop cultivation land of the surveyed households from 1,113 (normal time) to 602 decimals and the reduced land was converted to culture fish farming land. As a result, the amount of culture fish farming land was increased from 132 (normal time) to 643 in 2012. However, the culture fish farming land did not give the same benefit as crop cultivation to the female headed households because some politically and socially powerful groups dominated fish

Vulnerability and coping strategy of female-headed households

cultivation during a waterlogged situation. These groups pay the small amount of money for leasing land which is not equal to crop production. In addition, homestead vegetable cultivation also decreased in 2012 waterlogged situation. Waterlogging reduces not only agricultural land but also damages agricultural crops which create vulnerability of female headed household. The present study found about 23 percent households (n=71) lost their crops including paddy, vegetables etc. during 2012 waterlogged situation. The total value of damaged crops was BDT 10460 (average BDT 475.5) which is small in amount. However, the reality is it impacted the livelihood of female headed household because their agriculture land submerged in water, and additionally they lost their food grains.

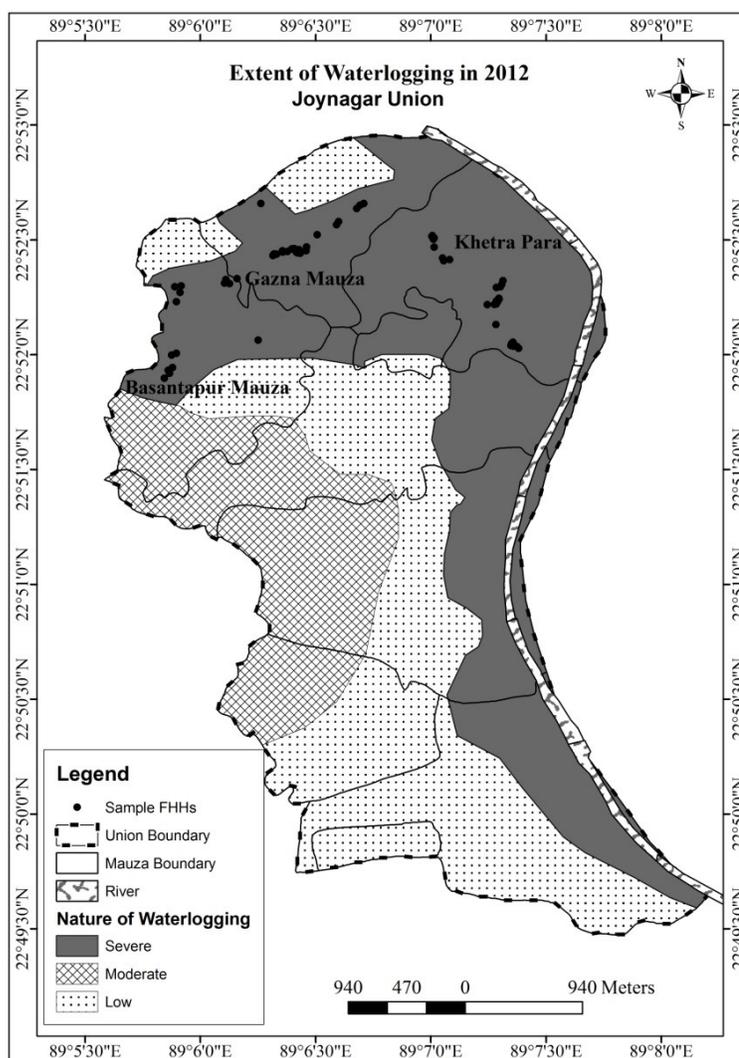


Figure 5. Extent of waterlogging in 2012

Drinking water supply

Safe drinking water is crucial to healthy lives and affluent communities. It is important to have 20 to 40 litres of freshwater per day per person for drinking, cooking, and sanitation needs alone (Editorials, 2010). The United Nations has declared "Water Quality: Clean Water for a Healthy World" as the theme of 2010 World Water Day. Approximately 1,100 million people of the world do not have access to safe and clean drinking water resulting ill health, lives shortened, and human toll (Editorials, 2010). Waterlogging is one of the common barriers to getting safe drinking water during the flood in the some coastal districts of Bangladesh (Awal, 2014). The present study found waterlogging affected FHHs of the study area suffered for safe drinking water because most of the functional tube wells and other water sources were inundated. This leads to social vulnerability of female-headed households. In normal situation, about 94.4 percent FHHs usually drink tube-well water and rest use pond and canal water. During study, 16 water options were identified under water and most of the users used the pond and or rain water during that time.

Human waste disposal

Sanitation is the basic key to a cascade of development challenges. Government and many national and international NGOs are trying to reduce open defecation since many years. Bangladesh has achieved significant improvement in reducing open defecation rates. This rate was 34 percent in 1990, 19 percent in 2000, 4 percent in 2010 and only 3 percent in 2012 (LGD 2013; Clark 2014). Sanitation condition is one of key indicator for assessing the vulnerability of female-headed household. This study found high open defecation rate among the surveyed families. Total 15 FHHs usually defecate in the open space or sometimes use pit latrine, but this number increases during waterlogging situation. In 2012 waterlogging, it increased to 27 households and people claimed that their latrine goes under water and they defecated at open space particularly in open water bodies around their homestead (Table 2). Another reason was that 2012 waterlogged situation damaged 18 latrines fully and or partially. Twelve systems were rebuilt or repaired by self-intervention, and costing was BDT 3750.

Table 2. Type of latrine in the study area

Type of latrine	Waterlogging in 2012 (N=71)	Normal Situation 2013 (N=71)
Open defecation or sometime use pit latrine	27	15
Ring slab with roof	11	18
Ring slab without roof	29	34

Vulnerability and coping strategy of female-headed households

Pucca (Brick)	4	4
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The results show that coping strategy about human waste disposal was very poor because open defecation was increased during waterlogging and this is one of the threatened issue to human health in the study area.

Family shelter

Family shelter denotes the main house or main room of the female-headed households. So, the total number of family shelter was 71 under surveyed 71 FHHs. Most of the main house is *katcha* with *khola* (earthen made tali or sheet which generally used as roof in the study area) in pattern and *dhauchala* (two shed) in design. Waterlogging significantly impacted on family shelter. Especially, *katcha* (bamboo, wood etc.) or mud house which roof made of *khola* were vulnerable to waterlogging. One house fully and seven house partially damaged due to 2012 waterlogging. In addition, about 22 percent house plinth was partially damaged.

Human health

Stagnant water, waste accumulation from the settlement and the dumping of the animal as well as human excreta into the water dramatically increased water pollution levels in the waterlogged area. There is a significance relationship between disease, hand wash and waterlogging. 2012 waterlogged situation increased water-borne diseases in the study area due to increasing uses of pond water for drinking purpose. It is mentioned that children were suffered more than the adult. About 50 percent was exposed to diarrheal disease including 36 percent child and 14 percent aged members among the disease affected family members (N=28) of the studied FHHs. The treatment pattern of the FHHs indicated that they believed in traditional methods. So, most of them went to village doctors called as *kabiraj* for treatment.

Coping Strategy of FHHs

The coping strategy of FHH was assessed in terms structural development, livelihood coping, agricultural and food coping, drinking water coping, and institutional initiatives to the FHHs for coping.

Structural development

The construction material of the wall of main room of the surveyed FHHs was mainly (about 90 percent) bamboo or mud with the roof of Tin or *earthen tali* (locally called *khola*). The study found that the female-headed household are coping with waterlogging by raising their homestead particularly house plinth, latrines, tube-well, roads etc. After 2012 waterlogging, about 43.7 percent households changed their main house plinth height up to 2.5 feet (Figure 6) and use stair to reach dwelling.



Figure 6. Raised plinth after 2012 waterlogging

Livelihood coping

Historically, the study area was an agrarian habited part of the coast with a few special occupation groups like agriculture, business, day labour, service, and fishing. 2012 waterlogging significantly impacted on the main earning sources of the female-headed households. After 2012 waterlogging, some head of present female-headed households changed their income source with a view to coping with waterlogging. It is observed that, after 2012 waterlogging, about 40 percent of main earning persons were gone abroad because they lost their earning sources and or their earning sources is in threat due to seasonal waterlogging in the study area (Figure 7). On the other hand, about 13percent new day labour created after 2012 waterlogging and about 12 percent lost their service (like monthly basis worker under shopkeeper, farm, etc.).

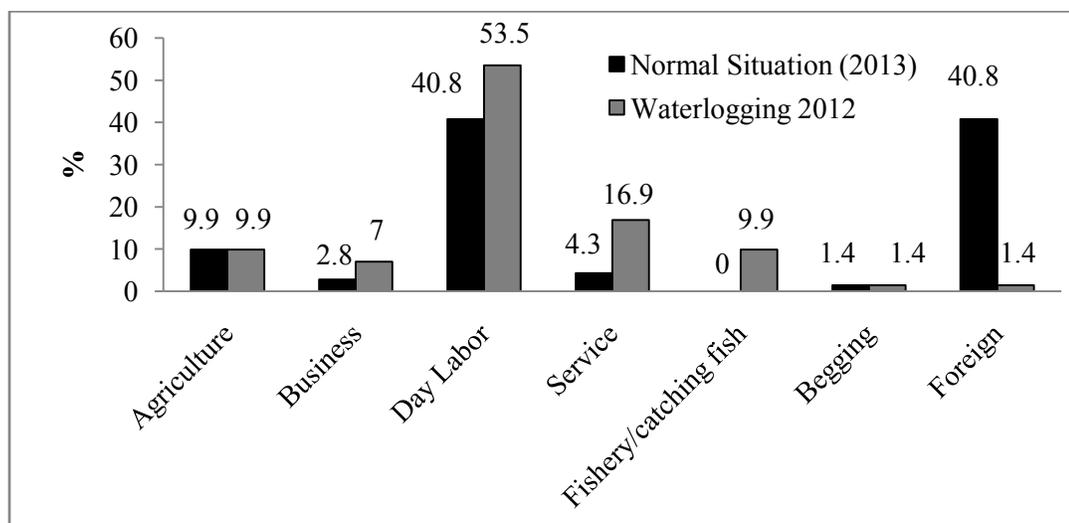


Figure 7. Sources of income during normal (2013) and waterlogged (2012) situation.

Vulnerability and coping strategy of female-headed households

Agricultural and food coping

The female headed households those have some lands cultivate vegetables there in order to coping with waterlogging. They cannot sell all the vegetables because they use these as their alternative of main food. This study also found female-headed households reduced their meal, eat less preferred food (especially the roadside vegetables), adult's members of the family restricting food consumption in order to feed the children, sending children to neighbours and relatives. On the other hands, many households consumed food from their stocks during 2012 waterlogged which had been stored for selling in future. The most common coping strategies such as selling belongings or borrowing money from Banks, friends or relatives, reducing expenditure on health care and seeking alternative or additional jobs were adopted by the FHHs to meet their food demand. There is a significant relationship observed between intake meals and waterlogging. In the study area, most of the FHHs (88.7 percent) intake three meal per day during normal situation but, it is decreased during waterlogging situation. About 38 percent household changed their meal size from three to two meals in 2012 waterlogged situation. Decreasing nature of income level as well as earning opportunities is the main causes of this unwanted situation reported by the respondents.

Drinking water coping

The waterlogged situation usually creates the extra burden to the FHHs to get safe drinking water. 2012 waterlogged situation damaged 16 water options and most of the user used pond and or rain water. In some areas, they collect drinking water from far away to cope with the worse situation. Even the water, they collect from the different sources is mostly contaminated that tended the incidence of diseases such as diarrhoea, dysentery, skin diseases etc. The damaged 16 water options were reinstalled and or repaired by the FHHs and only 20-25percent cost was shared by some non-government organisations (NGOs). This study found, about 48 percent FHHs stored drinking water using *kalash* (pitcher) and dram during the waterlogged situation, while it was 21 percent in normal time. It was also found that some male members of the family collected drinking water as like as female during waterlogging.

Institutional initiatives to cope up with waterlogging

It is estimated that about 1,300 million people of the world are poor and about 70 percent of the World's poor are women. Therefore, it is often argued that women, especially in developing countries, bear an unequal share of the burden of poverty (UNDP 1996; Mannan 2000). According to the respondents and general people, government did not allocate money for the waterlogging affected people and or FHHs during waterlogging in the study area. Typically, the government has some programs like 'food-for-work', 'cash-for-work', vulnerable group development (VGD), vulnerable group feeding (VGF), widow and old age allowance for struggle poverty in the study area. The respondents stated that they have to pay money indirectly to the

Union Parishad (local government) members to get the beneficiary card. This research revealed that only two widow female heads were getting benefits from the road maintenance work among the surveyed FHHs. Each beneficiary gets BDT 90 per day, which amounts to BDT 2700 per month. For getting this opportunity, they have to overcome several social problems because of traditional custom of 'purdah system' (a set of norms and regulations that seclude women from public spaces and gendered labour market). However, they are happy because at least this process creates an opportunity to bring some extra money for their families. This study also revealed that only one female-head got benefits from the program of Vulnerable Group Feeding (VGF) during waterlogging (2012). At present (2013), only two female headed households are coping with institution intervention, one is getting old age allowance BDT 300 per month and another one is getting widow allowance BDT 250 per month.

Conclusion

The study was conducted on 71 numbers of female-headed households (FHHs) in the coastal Joynagar Union under KolaroaUpazila, Satkhira, Bangladesh. About 66.2 percent of FHHs were living below poverty line (below \$1 per day per person) which was higher than the national level status (26 percent) in 2013. In addition to that, dwellers as well as FHHs of the study area have been suffering six to nine months waterlogging since 2002. This study also found that waterlogging has taken place because of dying of river (Kobadak), narrow drainage pattern, construction of embankment, and Farakka Dam by India as reported by the respondents. Almost every year it disrupted the normal human livelihood. The present study revealed that female headed households of the study area are vulnerable in terms of crop damages, reduce cultivable land, broken down water supply system, damages of family shelter particularly plinth, prevalence of disease, and disrupt sanitation system; all because of waterlogging. It was also identified that the FHHs passing through difficulties to cope up with waterlogging such as, working in subsistence farming and boring jobs, consuming food from stocks which had been stored for future selling in the market place, borrowing money or selling belongings to buy food grains, reducing daily meal, collecting water from far away, increasing main room plinth height etc. Therefore, coping strategy to ensure basic needs through different kinds of social safety net programs should be implemented at the household level supported by local institutions. Additionally, waterlogging vulnerability should be addressed through dredging Kobadak River and stopping river aggradations. The output of these studies can help policymakers and local administrators for developing effective mitigation measure to reduce the vulnerability of FHHs. The focus of future studies could be to include more waterlogging criteria and integrate those spatially using geospatial techniques for composite spatial vulnerability assessment.

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