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Assessing Household Vulnerability and Coping Strategies to Floods:

A Comparative Study of Flooded and Non-flooded Areas in Bangladesh, 2005

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 Cuvillier Verlag Göttingen

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Chapter One

1. Introduction

The characteristics and enormity of risks that households face, the access to risk management mechanisms, and the surroundings in which households operate their activities, play a significant role in poverty dynamics - these findings are supported by some theoretical analyses and empirical evidences (Holzmann and Jørgensen 2000, Heitzmann et al. 2002). Measurement of vulnerability would be an apposite approach to think about forward looking anti-poverty interventions, by explaining who is probable to be poor, how prone are they to be poor, why are they expected to be poor, and how poor they will be in the future. Vulnerability estimates could highlight the ex ante poverty reduction and alleviation efforts with some intrinsic instrumental values, such as: the risks that households face may cause a large variation in their income. In the absence of adequate assets and insurance to smooth income or consumption, such risks may lead to irreversible losses, such as damage of productive assets, the fall in a vicious cycle of debt, reduced nutrient intake, or disruption of education that eternally reduces human capital (Jacoby and Skoufias 1997). Therefore, vulnerability estimation to a recurrent flood disaster in Bangladesh could be an inherent aspect of well-being.

Bangladesh consists mostly of a low-lying river delta with over 230 rivers and tributaries situated between the foothills of the Himalayas and the Bay of Bengal. The country lies within the catchment areas of the Ganges, Brahmaputra and Meghna rivers which mainly drain through Bangladesh into the Bay of Bengal. In Bangladesh, floods are usually defined as the submerge of land by water which can damage crops and property, disrupt people's normal living conditions, communities infrastructures, household's communications and economic activities and endanger the lives of people and their livestock. The extent and depth of flooding vary from year to year depending on rainfall and river levels. Damages of floods also differ both in time and places. There may be a local flood affecting only a relatively small area in a particular part of the country, as in the year 2000 when a flash flood affected northern and eastern parts of the country. Or the floods may be extensive, as in the years 1988, 1998 and 2004, affecting large parts of

the country's major floodplains. Flood damages are reported in one or more parts of Bangladesh almost every year. Even in years with average rainfall, large areas of low-lying floodplains go under water for several weeks or months, as in the year 2005.

1.1 Problem Statement

With a population of 123.85 million and an area of 147,570 sq. km, Bangladesh is one of the world's most densely populated countries (839 per square km; BBS 2003). The combination of its geography, population density, and extreme poverty makes Bangladesh very vulnerable to disasters.

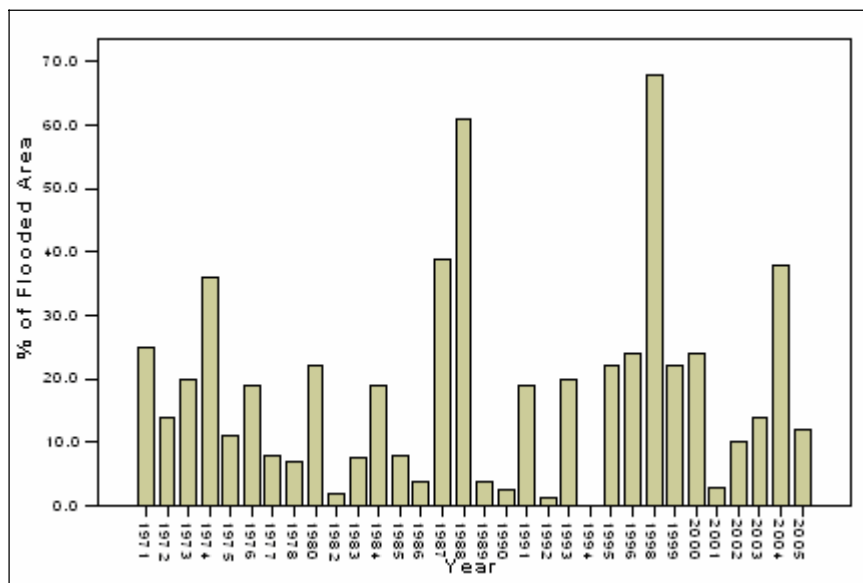
According to the *World Disasters Report 2003* (IFRC 2004), Bangladesh is among the top three most disaster-prone countries in the world, being vulnerable to cyclones, tidal surges, tornadoes, floods, droughts, earthquakes, and cold spells. Every year, on average, one million people are affected by disasters, 500,000 people are made homeless, and the nation's rivers consume around 9,000 hectares of fertile land. Since its independence in 1971, serious floods occurred in 1971, 1974, 1980, 1984, 1987, 1988, 1998, 2004 and 2007 as disastrous events¹. In addition, some cyclones and storm surges happened in May 1985, November 1988, April 1991 and November 2007. The 1974 flood was followed by a famine and as a result 30,000 people died (Alamgir 1980). In 1987, about 40 percent of the country was flooded in Bangladesh, affecting 30 million people and causing about 1,800 deaths. Loss of the main crop (paddy) was estimated to be 0.8 million tons. The floods in 1988 were even more serious, covering about 62 percent of the land area, affecting about 45 million people, and causing more than 2,300 deaths². In 1998, Bangladesh experienced the worst flood in its history. Over 68 percent of the country was inundated (Ninno et al. 2001), there were about 2,380 deaths, 1.56 million hectares of crops were lost, and over 900,000 houses destroyed. In the years 2000 and 2002, floods affected some 20 million people. In the year 2004, during July and August, devastating monsoon floods submerged two-thirds of the country, resulting in 35.9 million affected people, 726 deaths, 160,000 cases of disease and millions of homeless

¹ Disaster Management Bureau of Bangladesh 2005 and <http://www.reliefweb.int/rw/rwb.nsf/doc109?OpenForm&rc=3&cc=bgd> (last access March 3, 2008)

² Irrigation Support Project for Asia and the Near East (1993: 1) by FAP, Bangladesh

people; overall flood damages were approximately Taka 127 billion (about US \$2.2 billion) or 3.9 percent of GDP (US \$56.9 billion; ADB 2004). Residential housing, roads, bridges, crops, fisheries, and livestock suffered the most damage. The largest asset and output losses occurred in the agriculture (including livestock and fisheries) sector, which was estimated at Taka 34 billion (US \$580 million) or 27 percent of overall loss. About 12 percent of the country's area was flooded in the year 2005. Figure 1.1 below shows the frequency of floods by each year and the percentage of inundation area of Bangladesh since independence in 1971.

Figure 1.1: Frequency and area covered by floods in Bangladesh



Source: Flood Forecasting and Warning Centre, Bangladesh (2006)

1.2 Research Objectives and Questions

The frequent occurrence of disastrous floods results in losses for both human life and property values in Bangladesh. This study thus is set forth to examine the relationships between socioeconomic conditions and vulnerability to flood hazards. Such examinations would be instructive for both short term and long term poverty alleviation programs and risk management strategies in rural Bangladesh.

The endeavor of this study is to search the answers of the following key questions:

1. Who are the most vulnerable to monsoon and flash floods and how vulnerable are they?
2. What are the significant factors of vulnerability to floods in rural Bangladesh?
3. What coping strategies are followed by the flooded households and why?
4. Which methodology is suitable to estimate household vulnerability to floods in Bangladesh?
5. Which types of interventions are most likely to reduce vulnerability in rural Bangladesh?

Only a few studies exist which deal with floods and vulnerability in Bangladesh. Ninno et al. (2001) describe their findings from a survey of 757 rural households in seven flood-affected regions in Bangladesh after the flood in 1998. According to the authors, overall rice crop losses accounted for over half of the total agricultural losses that represent 24 percent of the total value of anticipated agricultural production for the year 1998. Brouwer et al. (2007) conduct a study on about 700 floodplain residents along the river Meghna in the southeast region of Bangladesh and show that households with lower income and lesser access to natural productive assets face higher exposure to risk of flooding. Kuhn (2002b) describes in his study from a floodplain in Bangladesh that households facing agricultural deficit are using remittances from urban migrants as a coping strategy instead of taking loans. Afsar (1999) shows from a study in rural Bangladesh that poorer households of the population tend to leave their homes immediately after the great floods and view migration as a temporary measure. In addition, households who lost their durable and productive assets are forced to become

permanent migrants to nearby urban areas. Recurrent floods that cause crop and livestock losses impoverish many farmers, especially small-scale farmers, resulting in increased indebtedness, land sales, unemployment and migration to urban areas in Bangladesh (Currey 1978). Montgomery (1985) illustrates, from Bangladesh's crop production statistics from 1969 to 1984, that diversified rice production is usually higher in years with high floods. Farmers who cultivate deepwater rice instead of low-water rice during flood seasons get benefit in high flood years. The extra moisture provides a bumper production of wheat just after the flood season (Brammer 1990). Therefore, to unveil the main research questions this study initiates with the following hypotheses:

1. Flooded households are more vulnerable than non-flooded households in rural Bangladesh.
2. Households whose main source of income is from agriculture are more vulnerable than others.
3. Income and crop diversification reduce households vulnerability to floods.
4. Rural-urban migration plays a significant role to mitigate vulnerability to floods.

1.3 Outline of this Study

This study inaugurates with the introductory chapter that depicts the reasons for choosing this topic and the main objectives. Chapter two describes the conceptual ideas on vulnerability from a literature review. The theoretical framework and four different methodologies are shown in detail in chapter three. Chapter four delineates the historical background of floods in Bangladesh and gives a short description of the topography of Bangladesh. This chapter also illustrates the sampling design and a brief description of surveyed areas, exploration of data, detection of outliers and results of descriptive analyses. Econometric analyses on households' poverty and vulnerability and their estimates are revealed in chapter five. Chapter six enumerates the coping strategies of flooded households and some diversification issues to mitigate further flood risk to rural livelihoods of Bangladesh. Finally, chapter seven summarizes the findings from this study and derives some policy recommendations.