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Clouds gather in the sky, but no rain falls. Vulnerability to rainfall variability and food insecurity in Northern Bangladesh and its effects on migration

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This article presents empirical evidence on changing rainfall patterns in Kurigram district in northern Bangladesh, on the local people's perception of these changes, and on their decision to migrate, or not, in order to cope with rainfall variability and food insecurity. Our study was conducted as one of eight case studies within the 'Where the Rain Falls' Project. Taking on a social vulnerability perspective, we show that migration from the region is not driven by climatic changes, but rather by the existing livelihood and labour migration systems. First, there is a distinct seasonality and thus rainfall dependency of rural livelihoods, which makes the rural population sensitive to changing rainfall patterns. Second, rainfall variability and food security are closely intertwined. Third, the distinct rhythm in the labour migration system is largely structured by seasonal hunger (*Monga*) in northern Bangladesh and by the demand for agricultural labourers and informal workers at the respective destinations. Fourth, persisting local patterns of social inequality shape both people's condition of food security and their decision to migrate for work or not. We conclude that, instead of climate change, social inequality and food insecurity as well as structural economic differences are the strongest drivers of migration inside Bangladesh.

Keywords: social vulnerability; food security; climate change; migration systems; social inequality; rural livelihoods

1. Introduction

Bangladesh is often referred to as one of the most vulnerable countries to climate change. There is mounting evidence that natural hazards such as floods, cyclones and droughts increase in frequency and that creeping processes such as river erosion, sea-level rise and salinity ingress continue unabated. Moreover, the already existing variability of rainfall is likely to be further accentuated; more rainfall and run-off are expected during the monsoon months, while the already scanty rainfalls in the dry season are likely to decline further in the future (cf. IPCC, 2007). Climatic shocks and slow-onset environmental changes have both the potential to damage the lives and livelihoods of millions of Bangladeshis. The rural population living in the southern coastal belt, in the drought-prone north or along the major rivers are particularly *exposed* to natural hazards and water-related risks (cf. World Bank, 2010). Agriculture-dependent rural livelihoods, in particular small-scale farmers and landless labourers, are most *sensitive* to climatic risks as these pose an additional burden besides chronic poverty and food insecurity (cf. CARE, 2005; GOB & WFP, 2004). From a social vulnerability perspective (cf. Bohle, 2007; Wisner, Blaikie, & Cannon, 2003), people's susceptibility to hazards and structural causes of their vulnerability need to be examined, along with their own

actions. We thus have to look at people's *adaptive capacities* in order to understand how they live with risks and uncertainties. Our research in northern Bangladesh shows that labour migration is one of the most important coping strategies of rural households in the context of climatic risks, seasonal food insecurity and structural inequality.

In the academic debate about climate change, migration is often discussed as a coping strategy against rapid-onset natural hazards and as an adaptation to slow-onset processes. If people leave a place, because their livelihoods have been negatively affected by natural hazards or environmental changes, one might speak of 'environmentally induced migration' (cf. McLeman & Smit, 2006; Pigué, Pécoud, & de Guchteneire, 2011; Warner, Hamza, Oliver-Smith, Renaud, & Julca, 2010 for an introduction to the debate and its contested terminology). In order to understand migration in the context of climate change, Findlay and Geddes (2011) argued that one should first investigate pre-existing mobility patterns and livelihood systems, and then assess the 'additional burden' that climate-related risks pose for people. Following this plea, the paper presents findings from a field study carried out in 2011 in Kurigram district in northern Bangladesh by CARE Bangladesh and the United Nations University Institute

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for Environment and Human Security within the project ‘Where the Rain falls’. The objective of this study was to understand the relationship between changing weather patterns, food security, social inequalities and human mobility (Warner et al., 2012; Warner & Affifi, 2014). The findings of the research in Bangladesh are documented in a comprehensive case study report (Ahmed, Hassan, Etzold, & Neerlormi, 2012). This article focuses on three core questions: Is the rural population in Kurigram district sensitive to rainfall variability? How does rainfall variability relate to the people’s condition of food security? Do people migrate for work to cope with and adapt to the effects of rainfall variability and food insecurity?

2. Environmentally induced migration in Bangladesh

Migration is a normal part of Bangladesh’s history and closely connected to its economic development. People have been moving throughout the delta for centuries – primarily in search of good harvests and secure livelihoods. In the 1960s, the population began to increase quickly and food demand showed a rapid increase too. With industrialization and economic growth, resource-poor villagers began to migrate to cities for alternative livelihoods. From the 1970s onwards, more and more people moved from rural to urban areas, spurring urbanization and in particular the growth of the national capital, the megacity of Dhaka (cf. Afsar, 2005; Haan et al., 2000). Today, improved transportation networks and modern communication technology have made mobility easier and cheaper. Migration is now very common. Most movements take place within the country and over shorter distances so that people can rejoin family members after a while. A longitudinal study (1994–2010) undertaken in 14 districts across Bangladesh found that 59% of all long-term moves occur within the respective districts, while 39% of migrants move outside their district of origin. Of these long-distance moves, 81% were to urban centres, 13% to international destinations and 6% to other rural districts (Gray & Mueller, 2012).

In Bangladesh, climate change cannot be considered as *the* major cause for migration. Nonetheless, climatic risks and environmental change have certainly altered the ways in which and the places where exposed people are pursuing their livelihoods. Ample empirical evidence exists on the effects of climate-related natural hazards, such as tropical cyclones or floods, on people’s mobility (cf. Black, Arnell, Adger, Thomas, & Geddes, 2013; Findlay & Geddes, 2011; IOM, 2010; Islam, 1992; Lein, 2000; Mallick & Vogt, 2012; Paul, 2005; Penning-Rowsell, Sultana, & Thompson 2013; Poncelet, Gemenne, Martiniello, & Boussetta, 2010; Warner, Ehrhart, de Sherbinin, Adamo, & Onn, 2009; World Bank, 2010). People in poverty, who live in exposed areas, are often most severely

affected by natural hazards, but this does not necessarily mean that most of them are also mobile. Anticipating a disaster, many flee to save their lives, while others (have to) remain behind for social, cultural or purely economic reasons. Members of some poorer households migrate after an environmental event and can indeed cope with its immediate effects, while others experience significant barriers to migration that exist irrespective of environmental hazards. Overall, there does not seem to be a clear link between temporary migration after a disaster and an increase in permanent migration (Gray & Mueller, 2012; Joarder & Miller, 2013).

Slow-onset environmental changes reveal a different kind of vulnerability. Sea-level rise and salt water intrusion were, for instance, first felt by farmers in the south-west of Bangladesh, not in terms of complete loss of livelihoods, but in terms of slowly decreasing yields that make it more difficult to sustain a purely agricultural-based life (IOM, 2010; Pouliotte, Smit, & Westerhoff, 2009). River-bank erosion is a common threat to people living along the major rivers and on the many Char islands (the riverbed sandbars) and regularly forces people to move their homes. For agriculturally based livelihoods, environmental stress is particularly acute when the soil quality deteriorates, when land has to be given up or when it is lost completely. Given the absence of alternative livelihood options in many rural areas, permanent displacement is then the logical and often the last consequence (cf. IOM, 2010; Penning-Rowsell et al., 2013; Poncelet et al., 2010).

In Bangladesh, the effect of shifting seasons and rainfall variability on local livelihoods and subsequent migration patterns has been studied the least. Previous research, however, indicates the importance of food security as an intermediate variable. A good harvest or crop loss depends largely on the availability of water in the right quantity at the right time. If farmers fail to respond to the variability in rainfall by using irrigation, they risk losing (parts of) their production. As poor subsistence farmers often cannot afford irrigation, too little water during the critical crop growing period decreases their own food production. If no alternative employment opportunities are available in the neighbourhood, short- or mid-term labour mobility can become the sole option to secure a household’s access to food (cf. Findlay & Geddes, 2011; Poncelet et al., 2010). According to Gray and Mueller (2012), a positive and significant relationship does exist between crop failures, which are primarily driven by rainfall variability, and long-term migration. However, the propensity to migrate permanently due to crop loss, and thus food insecurity, differs strongly among rural households. In case of a severe drought, landless labourers do not lose their own production, but rather their work. They are more likely to migrate permanently in search of work than members from households who have lost their harvest, but hope to recover at home. People’s *sensitivity* to rainfall

variability, which is a socio-economic determinant, and not their mere *exposure*, is then the key element to understanding their coping actions and their overall vulnerability to climatic risks. These findings can be verified through our study, too.

3. Study area and methodology

The research in Bangladesh focused on Kurigram district in Rangpur division in the country's north. The majority of the population in Kurigram is still dependent on agriculture, and the agriculture there is largely dependent on the available rainfall. Moreover, the region is known for a high incidence of poverty and seasonal food insecurity during the so called *Monga* period. In addition, the area is susceptible to monsoon flooding and riverbank erosion and has experienced significant changes in rainfall patterns. Within the district, four villages in Kurigram Sadar Upazila were selected, because of previous community adaptation work by CARE. Khanpara, an agricultural-based village in which around 600 people live, was chosen as a 'base village'. Most of the interviews and focus group discussions took place there. In addition, three 'satellite villages' were selected to generate comparative results; Khamar Holokhana (3800 people), Arazi-Kodomtola (700 people) and Doalipara (1000 people). Most of the people living in these villages are engaged in agriculture – 46% of the working population are farmers on their own land and 30% are agricultural labourers. The rest are wage labourers or work in commerce and community services (see Ahmed et al., 2012 for more details on the study sites).

In the Rainfalls project both quantitative as well as qualitative research methods were applied during field research in October 2011 in order to understand people's vulnerability to changing rainfall patterns, their condition of food security and their migration decisions. The quantitative data have been collected through a structured questionnaire survey involving 150 households. The households were selected randomly among those living in the four study villages. Qualitative data were collected through 33 focus-group discussions, in which a variety of participatory action research tools were employed, such as a comprehensive well-being analysis, livelihood risks rankings, timelines on agro-ecological changes and migration patterns, seasonal calendars, impact diagrams of rainfall variability, Venn diagrams on food security and migration networks or mobility maps. Moreover, 14 semi-structured interviews were conducted with experts from local and regional organizations involved in agricultural production and socio-economic development (see Rademacher-Schulz et al., 2012, and Ahmed et al., 2012, for more details on our methodology).

Although the triangulation of focus-group discussions, the household survey and expert interviews as well as previous research and community-adaptation projects by

CARE, allowed a deeper understanding of the relevant research issues, there are also clear limitations to our study. First, talking about longer climatic trends and more recent environmental changes remains challenging. For instance, the way the local people spoke about rainfall variability and their agricultural production seemed to be biased by very recent negative experience. Second, the available funds and time for research limited the scope of the study. Including more people at a greater variety of study sites in Northern Bangladesh would have contributed to more consolidated findings of our study. For organizational reasons of the whole research project, our study was conducted during the peak of the *Monga* season, when many people face acute food insecurity. A repetition of our survey just 2 months later after the harvest, might have yielded different results. Third, multi-local research, that also includes interviews with migrants at their respective destinations, should have been aimed at in order to understand the actual migrants' perceptions and decisions as well as their prior expectations and experiences as labour migrants. We spoke with return migrants and the family members of current migrants. Fourth, despite an open and interactive research process and careful selection of the members of the focus-group discussions, it has been difficult to address politically sensitive issues and cultural taboos that are highly relevant for studying livelihoods, food security and migration.

4. Rainfall variability, food security and migration in Kurigram district

Under what circumstances do households use migration as a risk management strategy in relation to increasing rainfall variability and food insecurity? This has been the central question guiding the 'Where the Rain falls' study (Warner & Afifi, 2014; Warner et al., 2012). The most relevant circumstances that affect environmental migration from northern Bangladesh are sketched in the following. They are, first, a distinct seasonality and thus rainfall-dependency of livelihoods; second, a clear relationship between rainfall variability and people's food security; third, a seasonal rhythm in Bangladesh's internal labour migration system; and fourth, social inequality and food insecurity in Kurigram as well as structural economic imbalances within Bangladesh as the strongest drivers of migration.

4.1. Rainfall dependency of livelihoods and perceptions of rainfall variability

In northern Bangladesh, agricultural production mostly depends directly on natural rainfall, as costly irrigation systems are not widespread. Therefore, variations in rainfall have direct effects on food production and people's incomes. The people are exposed to increasingly frequent

natural hazards and to a further accentuation of the already existing high rainfall variability. More erratic rainfall patterns include a bimodal shift of monsoon rains, with two short but sharp rainfall episodes at the beginning (in June/July) and at the end of the monsoon (in September) and significant dry spells in-between (in July/August); a potential decline in already scanty rainfall throughout the dry season; and less reliable occurrence of intensive rainfall during late-October (the so called *Kaitan Sato*). For Kurigram district, data show that the variability of rainfall is clearly increasing, while there is contrasting information regarding the reduction or increase of total precipitation.¹

In the Kurigram district, the local people's livelihoods are very seasonal in nature (see the seasonal calendars in Ahmed et al., 2012). Radical changes in rainfall patterns disturb the agricultural practices that have been learned and applied for generations and are thus perceived as severe livelihood risks. More erratic rainfall patterns have been noticed by the local population as one of several significant changes in the agro-ecological and climatic system since the early 1980s. Ninety-six per cent of the respondents in the survey noted an increase in dry spells and droughts, and 84% reported an increase in extreme weather events such as cyclones. Too much rain might result in excessive instead of 'normal' flooding, whereas too little rain leads to more dry spells and prolonged droughts. One woman in Khanpara commented on the unexpected dry spell during the 2011 monsoon season and compared it with her experience of the past: 'Back then clouds gathered in the sky and rain dropped, but now we can see clouds in the sky, but no rain falls'. This increasing variability in rainfall has implications for the vegetative cycle of major food crops (*Aman* rice, *Boro* rice and wheat) and for the abundance of fish in the ponds and rivers. It thus affects the overall availability of food. Erratic rain also affects the need for and availability of labour, and thus agricultural wage labourers' access to food. Moreover, people have noticed a shifting of the seasons: they remembered that 20 years ago there were always six seasons, but an overwhelming majority says that there are now only three or four distinct seasons in the year.

Overall, this shows that the local people are very aware of seasonal weather patterns, extreme events and changes in rainfall. This is no surprise because their livelihoods and food security reflect a seasonal rhythm. Erratic rainfall patterns have brought in a different dimension to people's vulnerability, as they complicate and exacerbate the existing livelihood problems of people living in poverty. While all local people are exposed to rainfall variability, the agricultural- and fisheries-based livelihoods (65% of all households) are particularly sensitive to them.

4.2. Effects of rainfall variability on people's food security

In Bangladesh, food production and food imports have increased steadily over the past 30 years. Sufficient amounts of food are *available* on the markets to feed the nations' growing population, but food insecurity is nonetheless among Bangladesh's most pressing problems (cf. GOB & WFP, 2004; Keck, Bohle, & Zingel, 2012; Zingel, Keck, Etzold, & Bohle, 2011). Food insecurity is a manifestation of economic and social inequality as people in poverty do not have an adequate *access* to food (cf. Ingram, Ericksen, & Liverman, 2010). In our study region in northern Bangladesh, rice yields have increased substantially due to the adoption of high yielding technologies, but many small-scale farmers simply cannot keep up with the rising input costs of production. Many farmers thus cannot produce enough food themselves to feed their families throughout the whole year. As follows, they rely on local labour opportunities to earn an extra cash income to buy food, which makes them dependent on market prices. Each year, from mid-September to mid-November, agricultural wage labourers and small-scale farmers face a period of hunger (the so-called *Monga* season) as only little labour is required on the fields before the actual harvest of *Aman* rice, the most important crop in the region. Owing to no or reduced incomes, many families are forced to reduce their consumption of food and consequently experience hunger during this critical period (cf. CARE, 2005; GOB & WFP, 2004; Selvaraju, Subbiah, Baas, & Juergens, 2006; Zug, 2006). In Kurigram district, food insecurity is a chronic problem, as people in extreme poverty face hunger all year round, and it is a seasonal phenomenon that is experienced by small-scale farmers and agricultural wage labourers. During the *Monga* period in September and October 2011, three-quarters of the interviewed households faced acute food insecurity.

Since rainfall patterns shape the local food production significantly, a greater variability of rainfall has severe implications for rural communities and, most importantly, for the food security of poorer families. Almost 90% of the surveyed respondents noticed negative effects of rainfall variability on their own livelihoods – whether directly through their own food production or indirectly through higher food prices. Rice is the staple food for millions of people in Bangladesh. Food security can then largely be understood as 'cereal security', which depends on people's own rice harvest (availability of food), the local availability of labour to earn cash income to purchase rice, and the market prices for rice (access to food). Since *Aman* rice, one of the two major rice crops in the study area, is grown under rain-fed conditions, too much or too little rain during the monsoon and the *Kaitan-Sato* period can affect *Aman* production severely. Our survey reveals

that about 80% of farming households cultivate rice for subsistence only. As the poorest families have only small landholdings, and they cannot afford irrigation or other investments to save their standing crops, a decline in productivity has a direct and severe effect on their food security. In Bangladesh, both agricultural and non-agricultural households are highly dependent on volatile commodity markets and thus are sensitive to food price hikes (cf. Keck & Etzold, 2013; Zingel et al., 2011). In our study in Kurigram, three-quarters of the respondents buy most of the food they consume from local markets. Almost two-thirds of all respondents stated that they had once felt the negative effects of rainfall variability as food prices in the markets increased temporarily when production declined unexpectedly due to too little or too much rain. Wage-labour dependent families, who primarily rely on market access for food, are hit harder by such temporal increases of food prices than are farming households, who buy about half of their food and produce the other half themselves.

The coping strategies against the effects of rainfall variability that were assessed both in focus group discussions and the survey largely represent the ways in which agricultural-based livelihoods react to challenges to their food security. If there is ‘too much rain’ at unexpected times, which results in floods, crop damage and temporary disruptions in the labour market, the vast majority of households (69%) reduce their food consumption. Almost half of the respondents rely on external help to gain access to food during these critical times; this includes food aid by the government or by NGOs. Almost one-third reduces their overall expenditure on food and other goods, which enables them to prioritize their spending on basic food requirements. One-fifth of the households rely on remittances from migrant family members in order to secure their food expenditure. Others sell assets, such as land or jewellery, and seek to increase their income through employment in the local labour market. Our study thus shows that the immediate effects of rainfall variability and most of the used coping strategies relate directly to food security in terms of the availability of food, the access to food and the utilization of food. In turn, this implies that if people cannot cope (in the short-term) or adapt (in the long-term) to further production loss and food price increases, food insecurity is exacerbated and the annual period of hunger is prolonged.

4.3. *Migrants from Kurigram in Bangladesh’s seasonal labour migration systems*

In northern Bangladesh, people see migration as a way to cope during a period of crisis, in particular, to avoid or reduce food insecurity (as noted by 79% of the respondents in our survey), but also as a normal income diversifying activity (as mentioned by 27%). At the time of the

survey, 43% of the households had members who were not present due to temporary or permanent out-migration. Ninety-seven per cent of the migrants were men. Although the number of out-migrants from the four studied villages has increased significantly over the past decades, this should not obscure the fact that the vast majority of the people in Kurigram district are not mobile. Eighty-eight per cent of the people living in the interviewed households, and in particular most of the elderly, people in extreme poverty, Hindu fishermen and women, have reportedly never migrated themselves.

Why do people migrate? According to the results of our survey, the major reasons to migrate can be ranked as follows: poverty and lack of employment opportunities in the home region, then food insecurity, followed by rainfall variability and natural hazards. However, it is not rainfall variability or a hazard as such that influences people’s decision to migrate, but their immediate and mid-term effects, most importantly crop loss, local unemployment or food price hikes (see also Black et al., 2013; Gray & Mueller, 2012; Martin, Billah, Siddiqui, Black, & Kniveton, 2013). More than half of the respondents indicated that a sudden decline in crop production, for instance, after a natural hazard had occurred or due to a dry spell during the monsoon season, is an important reason for out-migration. One elderly woman remarked, ‘In any incidence of hazard, if we lose [food] production we have hardly any alternative but to migrate’. In general, dry spells, shifts in seasonal patterns of rainfall as well as floods and storms were each seen by around 40% of respondents as important reasons to migrate. Lack of available land for cultivation, a decline in animal production and fish catch as well as poor soil quality and generally unreliable harvests – each of these relate to the local availability of food – were also mentioned as important reasons to migrate. Increasing food prices – the key indicator for people’s access to food – was in turn seen as an important migration motive by one-third.

Where do people go? Labour migration from the Kurigram region means almost solely in-country migration.² Most studies on migration in Bangladesh focus on rural–urban migration, in particular, to the megacity of Dhaka. In our study 49% of the movements were to urban centres, while rural-to-rural migration accounted for 47% of all movements (see Figure 1 for a map of the major destinations). Generally, members from more affluent households are less inclined to migrate. If they do so, they rather migrate to urban destinations, either for secure employment in the formal economy or for higher education. Most migrants, however, are people with no or only little own land to cultivate. In the cities, they can find work in the garments industries, the construction sector or in the urban informal economy, but they also need specialized skills and they need to take into account higher costs of living. If they temporarily move to other

rural destinations such as Munshiganj, Feni or Comilla instead, they can take advantage of their agricultural skills and benefit from the labour shortages throughout the sowing and harvesting season of rice or potatoes. Many migrants from Kurigram have established ties to employers in these agricultural regions. Moreover, they need good personal relations to so called *Sadars* – ‘migration entrepreneurs’ who negotiate wages with employers and who facilitate transport, accommodation and food for a group of labour migrants. Access to such networks enables a more secure migration, which is an important factor for a labourer’s migration decision. As follows, an agrarian labour migration system has evolved between Kurigram district and prospering agricultural regions in Bangladesh, like Munshiganj or Feni. Depending on the availability of work and the wages that are being paid, the labourers move back and forth between these places several times a year. Their livelihoods have become ‘trans-local’ (cf. Birtel & Peth, 2012).

When do people migrate? There is a distinct seasonal rhythm of labour migration from Kurigram. Despite the seasonality of hunger, it is worth noticing that migration seems to be driven by ‘pull factors’, rather than ‘push factors’. Most people do *not* migrate during the peak food insecurity period in order to cope with the most severe food shortages (September and October), since there are few employment opportunities in agriculture in other places during that period. Soon after, however, the opportunities to migrate to Munshiganj or Feni, for instance, improve as the *Aman* crop matures there and the harvest requires extra labour (late November and December). Between February and April, migrants do *not* leave because of acute food insecurity in Kurigram, but rather due to the temporary high demand for wage labourers at the respective destinations, for instance for the production of sweaters in Dhaka’s garments industry or for the cultivation of wheat or *Boro* rice in Munshiganj or Feni. The timing of the moves suggests that labour migration from Kurigram is primarily not a ‘sudden’ coping strategy in the context of seasonal food insecurity. It is also only rarely a long-term planned adaptation strategy to diversify risks and to raise the family’s income level. Migration rather seems to be an adaptation to the shifting seasonal requirements of the domestic labour market that is structured by the annual monsoon cycle and capital investments in the case of agriculture or which depends on consumers demands in the global fashion industry in the case of garments production in Dhaka (cf. Ahmed et al., 2012; Birtel & Peth, 2012; Kabir & Seely, 2008).

What are the benefits of migration? Labour migrants contribute significantly to the economy and to social transformation in Kurigram district. In the focus group discussions, it was often said that without the money sent back by migrants (three-quarters of all remittances are spend on food), many households would not be able to maintain

a basic supply of food. The migrants – no matter whether their move is permanent, seasonal or temporal, or whether they move to or circulate between cities, other rural areas or international destinations – work hard for a gradual improvement of their families’ lives and their food security. Nonetheless, labour migration also entails distinct social costs for those who are temporarily ‘left behind’. As the men migrate alone in most cases, the women ‘back home’ have to bear an even higher workload than normal, they are often overburdened to pay back debts, many are even less food secure, and some face social and sexual harassment in their husband’s or father’s absence (Ahmed et al., 2012).

4.4. Social inequality, food security and the propensity to migrate

Labour migration from Northern Bangladesh takes place within existing social networks and within established labour migration systems. But *who migrates in the context of rainfall variability and food security?* To answer this question one needs to bear in mind the inherent social inequality in the communities. According to the participants in a wealth-ranking, a households’ class or poverty status depends upon land ownership, material possessions, sources of income and labour relations and their food security. These factors help explain social differentiation in the migration process (see Ahmed et al., 2012, p. 71ff).

The comparatively ‘richest’ families are exposed to rainfall variability, as they have large agricultural farms, but they are not particularly sensitive to these changes as they have alternative sources of income outside of farming. As they enjoy good meals and snacks more than three times a day all year round, they are not subject to food insecurity. Consequently, they do not *need* to migrate to sustain their livelihood. However, they – or their children – *can* migrate for education or for formal employment. In Khanpara, 31% of these ‘rich’ households had migrants in their family. All the migrants were men, and all were living in cities. For this group, migration contributes to a further diversification of livelihood risks and an attainment of a higher social status.

Members of the ‘middle class’ directly depend on rain-fed agriculture and are exposed and sensitive to rainfall variability. They are not truly food secure all the year round and have to deal with seasonal food insecurity. In Khanpara, 41% of these ‘middle-class’ households had migrants in their family. Five of the 26 migrants were women; two of them had left for education. Twenty-one out of the 26 migrants worked temporarily in urban areas; mostly in the garments industry. This generally contributes to a diversification of the family income. Three had left temporarily to work in agriculture in order to cope with food shortages. Only two permanent migrants were in

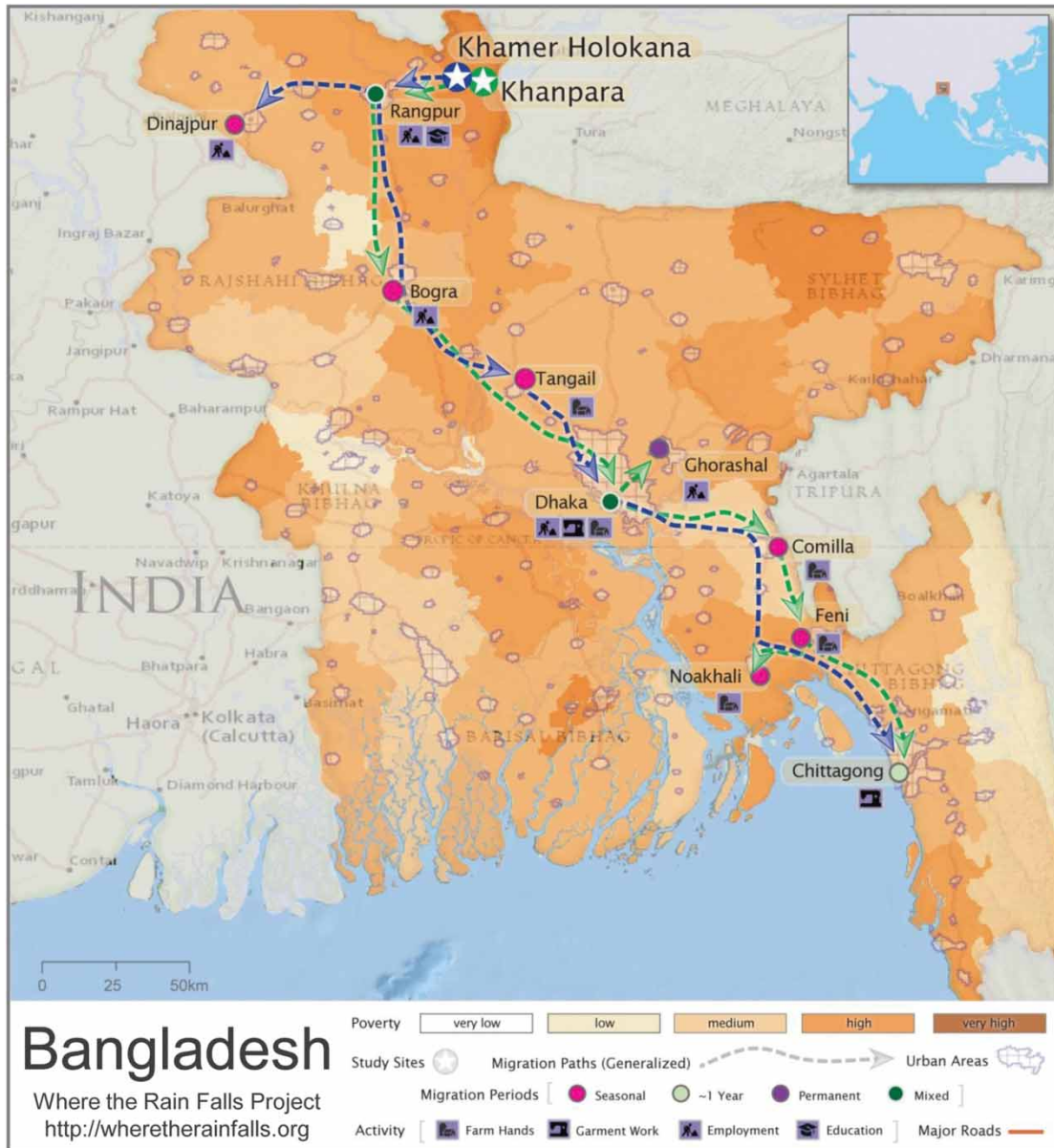


Figure 1 Migration pathways from our study sites in Kurigram District, Bangladesh. Source: Center for International Earth Science Network (CIESIN), Columbia University; see also Ahmed et al. (2012, p. 142).

this group. A stressful environmental situation, such as a dry spell during the monsoon, can surpass the adaptive capacity of these ‘middle-class’ households and push them back into poverty and hunger. ‘Successful’ migration, in turn, might enable them to diversify their livelihoods and increase their resilience to environmental risks. Either way, if the variability of rainfall increases further, migration might become an even more important risk management strategy for them.

The ‘poor class’ is probably most sensitive to rainfall variability as most of them are dependent agricultural wage labourers. Some families also have their own harvest, but the amount they can obtain is too small to meet their overall food demand. During the pre-harvest

Monga-season the scope of work in the neighbourhood is rather low. The dependent day labourers cannot earn enough and therefore do not have the money to buy sufficient amounts of food. In Khanpara, 49% of these ‘poor’ households had migrants in their family. No women were among the migrants. 18 out of 29 migrants, mostly the male heads of the respective households, temporarily worked as wage labourers in other agricultural areas. Seven temporarily worked in cities as rickshaw pullers or garments labourers (24% of the ‘poor’ migrants). Temporary rural–urban or rural–rural migration during or just after the *Monga*-season helps these poor families to cope with food insecurity. Their overall situation of dependency and seasonal insecurity, however, remains the same. A

further increase of rainfall variability in Northern Bangladesh will affect the local labour markets negatively, if no alternatives to agricultural labour are developed. Given a higher demand for labour in other parts of the country, the number of migrants from this group is likely to increase.

‘Extremely poor’ families are not that sensitive to changes in rainfall variability, as most of them are not involved in agriculture. They do, however, have to live with food insecurity all year round as they can hardly ever get three meals a day. During the annual *Monga*, their coping strategies are stretched to the limits; some even face starvation. In Khanpara, only two of these ‘extremely poor’ households had migrants in their family (i.e. 13%). Both migrants were sons, who worked as day labourers in Dhaka. Most families living under conditions of extreme poverty cannot benefit from migration to cope with hunger or to improve their situation in the longer term. They neither have adult male family members who could work as labour migrants, nor the required resources to facilitate migration, nor access to the necessary migration networks. These ‘trapped populations’ (cf. Black et al., 2013; Poncellet et al., 2010) are forced to adapt to adverse effects of increasing rainfall variability with the resources that are locally available to them.

5. Conclusions

Our case study fills a gap in the existing literature on ‘environmentally induced migration’ in Bangladesh. We did not focus on natural hazards or creeping environmental changes, but primarily looked at the variations of ‘normal’ rainfall patterns and their effects on migration. What role can rainfall variability play in the local people’s decisions to migrate or not?

First, due to the rainfall dependency of agriculture-based livelihoods, significant changes in the annual monsoon cycle – too much or too little rain at unexpected times – are perceived by the local people as livelihood risks. The rural population is exposed to rainfall variability, but different social groups are sensitive to its effects to a different extent.

Second, rainfall variability and food security are closely intertwined. An ‘untypical’ longer dry period during the monsoon season can potentially lead to crop damage and thus to a reduced overall food production. This will then also contribute to a local increase in food prices and reduce the demand for agricultural labourers throughout the harvest season. As a consequence, small-scale farmers and dependent wage labourers will have to reduce their own food consumption to cope with these effects of rainfall variability or they will have to seek an alternative income source, for instance by migrating for work to other places.

Third, there is a distinct rhythm in Bangladesh’s internal labour migration system that is largely structured by the demand for agricultural labourers and informal

workers at the respective destinations, but also influenced by the seasonality of hunger in northern Bangladesh. If rainfall-sensitive livelihoods in Kurigram district have been negatively affected by too much or too little rain at the wrong time, some households can make use of the existing migration systems and thereby cope with such a temporary crisis. There is, however, a significant lag between the time, when people are most food insecure and thus in need of immediate help or labour opportunities, and the time, when there is a high demand for their labour. During these critical weeks, it is of great importance that affected families have savings or assets that they can sell in dire need, that they have access to loans from shop owners or money lenders, or that they get food aid or institutional support from the Government or NGOs.

Fourth, people’s capitals and capacities as well as their social networks structure their migration opportunities. As follows, migration is always a process of social differentiation. The above sketched, probably too simplistic, ‘class-analysis’ showed that persisting local patterns of social inequality and food insecurity matter crucially for different social groups’ propensity to migrate in the context of rainfall variability. The most affluent and food secure people do not *need* to migrate in order to adapt to the negative effects of rainfall variability, because their livelihoods are already fairly resilient. In stark contrast, the poorest and most food insecure people *cannot* migrate at all. These most vulnerable ‘trapped’ households are forced to cope locally with rainfall variability. For the social groups in between these extremes, permanent, seasonal and/or temporary labour migration *can* become an adequate way of adaptation to climatic risks and environmental change. Some households are actually ‘getting ahead’ as migration led to a diversification of their livelihoods and a reduction of their sensitivity to rainfall variability. Members from other households migrate to cope with the immediate effects of rainfall variability. Yet, they are just ‘getting by’ and can neither get out of poverty, nor reduce their sensitivity to rainfall variability. Some households use migration as an option of ‘last resort’ (Penning-Rowsell et al., 2013) to overcome the worst periods of hunger, but their overall situation and the conditions for those ‘left behind’ actually deteriorate (see also the household profiles by Warner & Afifi, 2014).

Overall, our study showed that there are clear links between rainfall variability, agricultural-based livelihoods, people’s food security and their migration. The synopsis of these four points leads us to the following conclusion: Instead of rainfall variability – as one indicator of climate change – it is social inequality and food insecurity in the region as well as the structural economic differences between the more remote rural areas, on the one hand, and the major urban centres and prospering agricultural regions, on the other hand, that drive migration from Kurigram region. What the effects of labour migration are, whether

it contributes to people's resilience or their vulnerability, is of course another question, which we could not fully capture in our study. Further and in particular translocal and longitudinal studies at a variety of interrelated sites should thus be undertaken in Bangladesh to fully understand the complex, yet fascinating, relations between rainfall variability, food security, translocal livelihoods and human mobility.

Notes

1. The rainfall data from the Kurigram weather station suggest that monsoon rainfall *decreased* at a rate of about 0.55 mm per year (time series 1979–2010; data provided by the Bangladesh Water Development Board). In contrast, the analysis of three different databases (CPC-Unified, CMAP, APHRODITE) shows that the total monsoon rainfall in Kurigram district has slightly *increased* over time (time series 1980–2001; data provided by the CIESIN, Columbia University).
2. There was only one international migrant in 150 households in the survey, and none among the 118 households in the wealth-ranking in the base village.

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