

Climate Change and Its Impacts in North East India

“The rains have been delayed every year for the last few years; while the delayed rains are of concern, what really worries us is the change in rainfall – earlier, when the rains started, they would go on for days; nowadays, the rains don’t last for long, and there are long periods of hot, dry days in between. Moreover, when the rains do come, they are so heavy, it is as if the heavens have opened up!”

– Garo elder from Samanda village near Williamnagar, East Garo Hills

Introduction

The study looked at the perceptions of, and responses to, change in rural villages in two districts in North East India. The region lies in the far northeast of the country and comprises the eight states of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, and Tripura. It is known for its heavy monsoons, commencing in early April and lasting to October or November; Mawsynram in Meghalaya – ‘the abode of the clouds’ – holds the distinction of having the heaviest rainfall in the world. The monsoon period is typically cloudy, with heavy and continuous rainfall broken by short spells of up to 10 dry days. Dry, sunny days are rare.

The heavy monsoon and high humidity gives rise to a rich and diverse vegetation; the region has extremely high biological diversity, with some of the most dense rainforests outside the Amazon. North East India is culturally distinct from the rest of the country with a rich ethnic diversity and strong cultural affinities that can be traced to the Tibeto-Burman communities of China and Southeast Asia. The Government of India has provided special constitutional protection (through the Sixth Schedule of the Constitution of India) which confers on the ethnic communities the right of ownership and management of their natural resources in accordance with the traditional customary norms of each community, governed by their respective traditional institutions within the framework of the constitution. The North East is also one of the least developed areas of India.

Study Area

The study was carried out in five villages in two districts – Karbi Anglong in Assam and the East Garo Hills in Meghalaya (Table 12) using a participatory rural assessment (PRA) approach. Karbi Anglong is predominantly inhabited by Karbis, and the Garo Hills by Garos. Both communities are agrarian, predominantly shifting cultivators with a strong dependence on forest and other natural resources. Despite government efforts to replace shifting cultivation with settled agriculture, both communities continue with this practice. Landholdings and access regimes among both groups were traditionally within a common property framework, and largely remain so. In the past few decades, private holdings have slowly emerged, inadvertently encouraged by different government programmes promoting the conversion of shifting cultivation into settled agriculture. Where shifting cultivation prevails, the common property regimes still apply. Access to common land – village land in the case

Table 12: Villages surveyed in North East India

District/Village	Altitude (masl)
Karbi Anglong	
Umphu	576
Borphu	478
Uzandonka	406
East Garo Hills	
Bolmoram A Dapgre	519
Kalak Songgital	435

masl – metres above sea level

of Karbis and 'akhing' land among Garos – is still controlled by traditional institutions, although the tenurial rights to shifting cultivation plots for each household within a village remains a hereditary right. The Karbis are patriarchal while the Garos are matrilineal; tenurial rights are inherited by sons among Karbis, and by daughters among Garos.

The Garos have strong indigenous roots and continue to depend on the traditional practice of shifting cultivation, collection of forest products, and to a lesser extent poultry and piggery for their livelihoods. A gradual 'comodification' of shifting cultivation has emerged, and it is common to see surplus agricultural and forest products sold in nearby markets. Income from produce is supplemented by wage labour. Among others, the National Rural Employment Guarantee Act (NREGA) provides a legal guarantee of 100 days of employment every financial year for a household. Animal husbandry is an important investment for households since animals can be sold at times of need. The sale of animals during festivals – particularly Christmas and marriages – is an important source of income.

The Karbis are also dependent on agriculture and practice shifting cultivation, clearing small plots for cultivation each year in a rotation system. Market towns are close by and communities are able to sell vegetables, wild edibles, and fruit such as banana, pineapple, jackfruit, mango, and guava, grown in their shifting cultivation fields and home gardens or collected from the regenerating shifting cultivation fallows. Ginger and turmeric are important primary cash crops; trade in these is primarily through commission agents engaged by outside traders for markets outside the region.



A young woman picks spring onions grown under shifting cultivation

Communities' Perceptions of Change

The primary concern of communities appeared to be erratic, rather than delayed or reduced, rainfall. The extremely hot and humid weather during the spells between rainy days was also a recent and unwelcome phenomenon.

Farmers in the East Garo Hills had noticed a delay in the onset of the monsoon, which was also observable but less significant in Assam. Local variations in climate complicate the perceptions. Overall appraisals in several villages in Assam indicated a lengthening in the duration of precipitation, whereas some of the individuals interviewed had experienced the opposite, with a decrease in overall precipitation. Farmers in both Meghalaya and Assam found that the monsoon is no longer predictable, and the sowing and harvesting calendars have had to shift. There were longer dry spells between the rain, but the rain was heavier when it did fall, severely affecting crops and ultimately yields from their fields. The dry season was thought to be lengthening and more severe, with long periods of hot, dry days associated with a drying up of springs and drinking water shortages. Overall, farmers across the study area thought that both summers and winters were warmer.

Hailstorms were thought to be less frequent, except in one community, although their severity appeared to have increased dramatically. Flash floods were noted to have decreased in one district of Meghalaya.

Crop pests and disease were thought to have increased moderately or severely across the study area. Farmers thought this might be a result of the change in monsoon onset and of changes in temperature. Rhizome rot disease was affecting ginger and reducing the income from this crop in parts of both Meghalaya and Assam.

Impacts of Change on Livelihoods and Community Wellbeing

Food security

Communities in both districts expressed concern about the change in precipitation patterns leading to a drying up of water sources – rivers, streams, wells, and springs – for drinking water and irrigation.

The dry season appeared to be lengthening, which “delays sowing and transplantation, particularly of rice as most of upland agriculture is rainfed”. Furthermore, the increased severity of hailstorms was causing damage to standing crops in September, sometimes completely destroying the year’s standing paddy crop. Hailstorms earlier in the year also damaged flowers, preventing fruit set, and resulted in early fruit fall among horticultural crops such as citrus, mangoes, lychees, and other fruit.

The erratic nature of precipitation had a serious negative impact on harvests. A woman from Assam explained, “These grains are not ripe for harvest yet, but instead of being sunny and helping the crop to ripen, it has been raining, so we cannot harvest the crops and probably they will go bad in the field”. Others from Meghalaya remarked that “for the past few years, there has been an increased incidence of dry spells between rainy days, resulting in the wilting of germinated crops. The dry spell is followed by sudden heavy rains often resulting in the erosion of soil around roots, exposing them to drying during the dry days that invariably follow – this cycle of drying and heavy rains is destroying our crops”. The reduction in soil moisture was also affecting production of staples (rice, millet) in Meghalaya. Overall, the impact was inducing and perpetuating food insecurity in the region.

Daily life

As springs and other sources close to villages dry up, women’s workloads are increasing as they have to travel further to fetch water. The changes in the weather also encouraged weed growth; farmers noted that it takes twice as long to weed as in the past. Moreover, as the productivity of agriculture declines, men search for wage labour opportunities, adding both to their workloads and to the workloads of their wives. Conversely, the warmer temperature in the winter has reduced the need for fuelwood and the time taken to collect it.

Community-Based Responses to Change

The major difficulty for villagers was coping with the uncertainty of climate variability. As one farmer from the East Garo Hills explained, “We knew how to deal with delays in rainfall or with heavy rainfall – at least there was a known pattern; how do you deal with situations when the rains are delayed for weeks, and then when it comes, you have the heaviest downpour as if it is the height of monsoon! Then the rains don’t last for long and you have days when it is dry and hot instead of continuous rain. We don’t know how to deal with this erratic climate!” People also claimed that following their conversion to Christianity, they had lost the traditional knowledge from their ancestors which would have helped them to deal with such situations. The church generally perceives traditional practices as primitive and to be replaced by ‘modern/scientific’ approaches – thus indigenous knowledge and traditional practices are not being passed down the generations. Nevertheless some strategies – both new and traditional – have been adopted by the communities to cope with the stresses resulting from climate and socioeconomic change, although with the growing variability in weather patterns, some of these mechanisms may not be effective in limiting damage in the longer term. The community responses are summarised in Table 13 and discussed in more detail in the following paragraphs.

Responding to erratic rainfall patterns and too little water

Farming communities have adjusted the timing of sowing and harvesting of cereals and vegetables to cope with the changes in the timing of precipitation and temperature. New varieties of seeds have been introduced which require less water and can be harvested earlier, for example methungja, a local variety of rice, and alikha, a variety of millet, which are drought resistant and have better productivity. Crop varieties that withstand strong winds and storms have also been planted.

With soils becoming dry as a result of delayed rainfall, farmers dibble seeds, particularly maize, deeper into the soil where soil moisture is higher, increasing the chance of the seeds sprouting and taking root. Elsewhere, farmers select sites with shade and higher soil moisture for seed beds. In order to retain what soil moisture is available and prevent further evaporation, farmers use crop residues and weeds as mulch, or add organic compost and manure around emerging seedlings to ensure their survival.

In extreme cases, when seeds fail to sprout or sprouted seedlings wilt, farmers re-sow the field with different crops. When cereals fail, farmers replace them with sesame, soybeans, or ricebeans (*Vigna umbellata*), crops that are suited for harsher conditions and tolerate stress. Fruit crops such as banana trees are intercropped with lychee and areca nut (*Areca catechu*) trees, combined with mulching to spread risks from moisture loss and other stresses.

Table 13: **Community response to perceived change in North East India**

Perceived change	Experienced impact on livelihood systems	Response
Erratic precipitation patterns	Decline in agricultural productivity/crop failure	Changes to agricultural calendar: delayed or early sowing and harvesting of crops Introduction of water stress tolerant varieties Borrowing grain from self-help groups (SHGs) Introduction of new cash crops such as ginger, turmeric, cardamom, and chillies Collection of NTFPs Increased engagement in wage labour Participation of a household member in the NREGA programme
Overall decreased water availability	Reduced soil moisture/decline in agricultural productivity	Dibbling maize seeds deeper into the soil Cultivating crops in shady locations with higher soil moisture Mulching with organic compost and manure
Too much water	Loss of harvests and property	Use of bamboo matting to protect terraces from flash floods
More severe storms	Loss of harvests and property	Introduction of varieties that can withstand strong winds
Increase in pests and disease	Reduced production	Traditional pest management strategies (e.g. dead crabs and sour bamboo shoot extract)
Increasing temperatures	Beneficial conditions for some crops	Introduction of off-season vegetables

Dealing with too much water

Flash floods often deluge terraced plots, destroying standing crops and damaging the terraces with the debris carried by the flood water. An innovative coping strategy practiced by upland farmers in the Garo Hills is the use of bamboo matting across inlet channels to trap the silt and debris brought by the floodwater. The bamboo matting allows the water to flow in while the silt and debris are trapped. This reduces the workload of farmers in repairing the fields, while strengthening the bunds along which the matting is laid.

Combating crop pests and disease

Traditional organic pesticides such as pomelo skin, dead crabs, and sour bamboo shoot extract are used to ward off pests. Samsnung (smelly leaves), bamboo leaves, and magrit (grass) are also applied to repel pests on wet terraces. These measures are effective with low levels of pest infestation, but less so when pest infestation is severe. Chemical pesticides are also used, but to a much lower extent than in other areas.

Livelihood diversification

In times of food insecurity, wild or forest sourced indigenous foods such as game, fruit, tubers, ferns, mushrooms, and honey are collected for household consumption and sale. Fish are also raised to enrich the diet and as a source of income; a pond built in East Garo by the state to store water was converted into a fish pond by a self-help group.

Agriculture is increasingly focused on cash crops, especially ginger, turmeric, cardamom, chillies, leafy vegetables, and tomatoes. North Eastern Region Community Resource Management (NERCOMP), an IFAD project, has introduced home gardens to produce seasonal vegetables for local markets in villages at higher elevations to diversify incomes.

With productivity declining and yields becoming insufficient, many households look for wage earning opportunities outside the village. Although wage labour through NREGA is assured for 100 days within the village, many people leave the village to look for seasonal earning opportunities in plantations, road building, or mines. Many women use handicrafts and weaving to supplement household income.



Livelihood diversification is making households more resilient to shocks: Weaving traditional cloth and chillies for sale on the local market

Social safety nets as important fall back mechanisms in times of need

Social safety nets, particularly those extended by the family and traditional institutions, are extremely important both among the Karbis and the Garos. The church and church initiated groups are also significant support groups in times of need. The self-help groups promoted by the IFAD projects have also emerged as important mechanisms that provide a safety net in difficult times. Self-help groups not only provide micro-credit, they also have food banks which help people to borrow grain at times of food shortage.

The government NREGA programme aims to enhance livelihood security in rural areas by guaranteeing 100 days of unskilled wage employment per year to households that fall below the poverty line. This government system is much used by the communities in the study area.

Differences in Vulnerability and Adaptive Capacity

There is no caste system in North East India and thus no discrimination based on caste. Similarly, upland communities make little distinction between rich and poor. Educational attainment does have an influence on vulnerability, however, since the better educated usually enter into the bureaucracy or politics and are less reliant on climate sensitive occupations.

The matrilineal culture in Meghalaya has enabled women to play a major role in decision-making. Men also assist in household chores, and women frequently trade in markets. Women in Assam are less active, but with the establishment of self-help and other affinity groups, this is changing rapidly.

Institutional Opportunities and Constraints

Community-based institutions play an important role in North East India, particularly in times of environmental and socioeconomic stress. Some of the more important formal and informal institutions active in the study area are listed below, together with the associated opportunities and constraints.

Local institutions

Village headman – Each village has a headman, called the *gaonbura* in Assam and *nokma* among the Garos in Meghalaya. The headman is more a custodian than an authoritative head. The *gaonbura* is assisted by clan elders in taking decisions; the *nokma* takes decisions in consultation with the *maharis* or maternal uncles of the *nokni* (heiress), particularly with regard to access and control of resources, and executes the decisions.

Self-help groups – Assisted by local organisations, these groups have started micro-credit activities, helping communities start small income-generating activities such as pig and poultry raising, as well as vegetable gardens. They also provide physical support.

Kinship (relatives, clans) – Relatives and the clan are extremely important in times of need. Households generally turn to close relatives within or outside the village for immediate relief; for greater relief, the clan is of paramount importance. Clan members, as a body, will contribute towards the needs of a family belonging to the same clan. The help extended could range from cash support, grain, and shelter, to access to common property resources as well as access to formal support institutions.

Church and church bodies – The church and church-promoted social bodies play a prominent role in times of need. The support extended to needy families is confined to members of the same denomination; it does not extend to non-Christians and is not universally available.

Government institutions

Block development office – The block development office is responsible for implementing and overseeing various projects and schemes instituted by the government. In Meghalaya, this office has provided support for areca nut plantations, construction of ring-wells, low cost houses, schools, and roads.

Horticulture/agriculture departments – These departments have been assisting communities with the supply and plantation of saplings of cash crops such as rubber, coffee, tea, ginger, turmeric, and pineapple.

Soil and conservation departments – These departments have made efforts to increase irrigation potential in the study area and bring more land under cultivation. They have also provided land development activities for wet terraces and orange plantations.

National Rural Employment Guarantee Act (NREGA) – This scheme guarantees 100 days of employment per fiscal year to anyone with a 'below poverty line' (BPL) card. The NREGA is crucial in providing a source of income for low-income households. Activities include repairing water harvesting structures, fisheries, footpaths, and labour on rubber plantations.

Climate Change Policy

The relevant policy in India is summarised in the case study on Uttarakhand.

Conclusion

Although communities possess autonomous mechanisms for responding to change, it is clear that there is a strong need for support from the government support services. It will be very important to strengthen delivery mechanisms, particularly with regard to access to information and technical services. Options for income diversification need to be explored as cash generation is critical at times of stress. Risk management also requires attention. Mixed cropping, seed exchange, and related traditional practices that spread risk need to be encouraged at the local level, complemented with formal risk insurance mechanisms.