It Doesn't Rain on Time: Climate Change and Its Impacts in Eastern and Western Nepal

"I am very poor, I don't own land or a house. I work on other people's land and receive half of the total annual production as compensation. During last year's drought, I cultivated everything in small amounts but the seeds germinated and then dried up. They did not bear any fruit and not even the cattle wanted to eat the stalks. So I was forced take a loan to buy food."

– 70-year-old man from Terhathum, August 2011

Introduction

The study looked at the perceptions of, and responses to, change in rural villages in two different parts of Nepal. Over 80% of Nepal's population is rural (IM undated); the great majority involved in subsistence agriculture. Nearly one quarter of the population lives on less than USD 1 per day, and more than half of the 75 districts are food deficient (FAO 2010). There is a clear connection between poverty, food security, and worsening agricultural productivity, which is at least in part a result of climate change. For farmers, changes in water availability and timing have become the crucial symptom and effect of climate change.

Study Area

The studied was carried out in three village development committee areas (VDCs) in Bajhang district in the far west and five VDCs in Terhathum district in the East (Table 7). Bajhang is one of the most underdeveloped districts in the

Table 7: **Villages surveyed in Nepal**

District/VDC	Altitude (masl)	No. of HHs*	Population*			In-depth HH interviews
			Male	Female	Total	
Bajhang						
Surma	2,400	453	1,309	1,296	2,605	8
Chainpur (Mayana village)	1,950	925	2,594	2,547	5,141	8
Chainpur (Khalapata village)	1,100					8
Rayal	950	1,011	2,904	3,187	6,091	8
Terhathum						
Solma	2,000	842	2,206	2,389	4,595	4
Oyakjung	1,870	937	NA			8
Myaglung	1,670	1,279	NA			8
Sabla	1,550	467	NA			12
Panchakanya Pokhari	750	438	NA			11

masl = metres above sea level; HHs = households; NA = not available

*Source: CBS 2002

country; 75% of the residents have insufficient food for half the year. Food security is very poor in Bajhang, which has an 'extremely alarming' global hunger index value (the worst category on a five-point scale), and only slightly less so in Terhathum, which has an 'alarming' global hunger index value (NPC 2010). The study was carried out in July/August 2010, in a year when Nepal was affected by an extreme drought. Terhathum was revisited in August 2011 in order to validate the data gathered in the previous year under extreme conditions.

The primary occupation in both districts was agriculture; approximately 10% of women and 20% of men in the study areas had non-agricultural occupations (production of goods and wage labour). In Bajhang, there was a growing trend towards involvement in the collection of high-value NTFPs, which was seen to be very profitable. Less than 15% of the agricultural land in Bajhang, and 21% in Terhathum, was irrigated. Agriculture was considered to be more profitable in Terhathum than in Bajhang as farmers had high yields of ginger and cardamom.

In the past, education has had a low priority and the literacy rate of adults in rural areas, particularly women, is low. The literacy rate was 71% for men and 48% for women in Terhathum and 60% for men and 18% for women in Bajhang. Life expectancy was 42 years in Bajhang and 55 years in Terhathum (DAO 2010).

Communities' Perceptions of Change

"Betime-ma pani aucha, ke garnu." (It doesn't rain on time, what to do.)

The monsoon is the most important seasonal phenomenon for rainfed agriculture. Major food crops such as rice and maize, grown in the summer, depend completely on this annual precipitation. The most significant observation was a trend towards delayed onset of the monsoon, noticed over the last 10 years, but with differences in the delay. People also noted increasing numbers of dry spells during the monsoon period, lasting up to 15 days and damaging crops. Associated with this was a perception that the dry season was longer and more severe.

Living in Terhathum

A Dalit couple aged 51 and 48 from Sabla, Terhathum described how weather patterns have become increasingly erratic and how this is challenging their livelihoods.

"People may say what they want, but I have 41 years experience. These days when it rains it rains heavily and uncontrollably and even the earth cannot hold the water, but sometimes it doesn't rain at all", explained the husband.

"There used to be sunny days and rainfall like we wanted, but these days God is not in the mood to give us all that, he doesn't like to see us happy…", his wife continued. "Even if there is a drought and food shortage we need to eat. With a half full stomach it is impossible for us to work. Taking loans has become quite normal. Of course we will pay them off someday but if we don't we will run away from this place, not in the daytime but during full moon so that we don't get hurt", she added smiling.

In contrast to 2010, the monsoon rains started early in 2011, and in August 2011 the communities in Terhathum were hopeful for their crops. Nevertheless, they confirmed the perception expressed a year earlier that the annual total precipitation had decreased and rainfall patterns had become more erratic. Further, they said that there used to be at least some rainfall in almost 11 months of the year, even if it was only once in a month, with 2 to 5 months of heavier precipitation. This low intensity rainfall had disappeared almost completely, with rain falling only in the monsoon months. Winter precipitation – snowfall at higher altitudes and rain at lower altitudes – was thought to have decreased at both study sites. Some communities, accustomed to snow 5 to 6 months a year, with 1 month of high intensity snowfall, claimed that it was snowing less and snow was lasting for a shorter period. Winter rainfall is crucial for recharging of groundwater and replenishing springs, and some springs had already dried up.

Hailstorms appeared to be less frequent, resulting in less hail damage. Communities in the east noted that the incidence of floods and landslides had decreased with the reduced precipitation, whereas respondents in the west perceived an increase (partly due to high intensity rainfall in 2009 which had caused severe landslides and loss of life and property).

Perceptions regarding changes in temperature were mixed, although communities had noticed that both winters and summers were warmer. An increased variability in temperature had been observed particularly at higher altitudes, and there was a sense that the temperature was diverging from regular patterns, but the change itself was hard to pinpoint. One respondent in Terhathum claimed that food would spoil in three days instead of seven in the summer. Mosquitoes had been observed at higher altitudes than previously and during months when it used to be too cold, but this could have been due in part to the recent construction of unpaved roads in the study areas, which had resulted in deep tracks being left by heavy vehicles that were now filled with stagnant water.

Apart from issues related to water and precipitation, respondents were most concerned about the increase in crop pests and disease. With crops already negatively affected by the changing weather, the increased incidence of pests and disease had exacerbated the food security situation in the areas studied. Not only had there been a significant increase in known diseases and pests, but newer afflictions were also being observed. 'Ranke' (blight), which had devastated the maize harvest in 2009, appeared to be affecting other crops as well. 'Thaulya' was a new disease; it prevents grain formation in millet and paddy and had affected the millet harvest drastically in 2009 and continued to damage harvests. Communities speculated that the white grub 'khurkulo' thrives in the absence of rain, as both grub size and population seemed to be increasing. Other pests affecting yields included 'sindure', 'bet', and black beetle. Although there was a potential link to climate change, farmers in Terhathum also linked the unprecedented incidence of crop pests with monoculture crops and the increasing use of chemical fertilisers.

The perceptions of change are summarised in Table 8.

Table 8: **Perceptions of change in Bajhang and Terhathum**

Aspect	Bajhang	Terhathum
Onset of monsoon	Delayed, more unpredictable	Delayed, more unpredictable
Annual precipitation	Significant reduction in amount and duration, increase in high intensity events that caused damage, erratic	Significant reduction in amount and duration, erratic
Winter precipitation	Severe decrease in amount, intensity and duration of snowfall; reduced or no winter rain	Slight decrease in amount and intensity of snowfall (at high altitudes), significant decrease in amount of winter rain
Dry season	Significantly longer	Longer, more intense
Hailstorms	Decrease	Decrease
Frost	Slight decrease in some areas	Slight decrease in some areas
Temperature	Warmer at higher altitudes, increased variability	Warmer at higher and lower altitudes, increased variability
Crop disease and pests	Significant increase and new pests observed	Significant increase and new pests observed

Comparison of Perceptions of Change with Climate Records

There is marked topographical and altitudinal variation within small areas in Nepal (as in the Himalayas in general) and data collected at individual stations provide only an indicative idea to compare with local perceptions in villages located some distance away. Nevertheless it is interesting to make the comparison, bearing the limitations in mind. Data were available from two hydro-meteorological stations in Bajhang from 1956 onwards – Chainpur at 1,304 masl and Pipalkot at 1,456 masl – and from one station in Terhathum at 1,633 masl from 1971 onwards. Detailed meteorological data are given in Annex 2; the results are summarised briefly below.

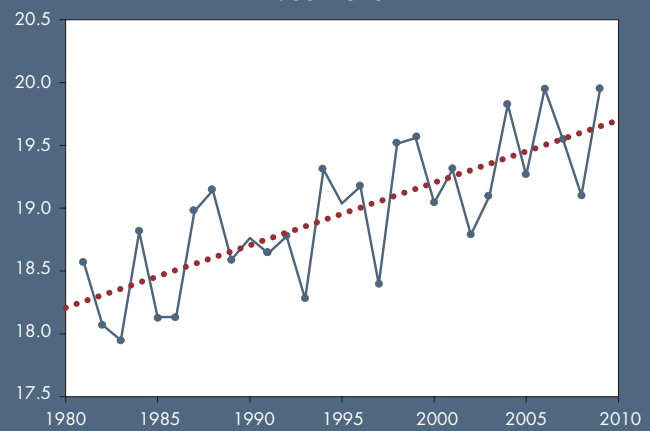
Precipitation

Data from the two stations in Bajhang showed clear differences; overall the results indicated the marked interannual variability and localised nature of rainfall, more than any clear trend. Both stations showed a slight increase in average annual precipitation over the whole 50 year period, but there had been a slight decrease in Pipalkot over the 30 years before the survey and a more marked decrease over the 10 years preceding it, while no significant change was identified in Chainpur over the 30 years. Winter rain was highly variable at both stations, but with an indication of a decreasing trend. Pipalkot had had almost no winter rain in the 2 years leading up to the survey. In 2009, the annual rainfall was the lowest in 30 years, considerably less than half that of 1999/2000. In Bajhang the number of rainy days appeared to be decreasing, and the number of extreme rainfall days slightly increasing. Terhathum also showed a slight increase in average annual rainfall over the whole period, but a decrease over the last 20 years. Recent years had shown marked variation with, for example, twice as much precipitation in 2005/06 as in 2004/05. Winter rain was highly variable, with almost none falling in the 2 years before the survey. Overall, the marked variability, and recent dryer trend, matches the local perceptions.

Temperature

Temperature data were only available from Chainpur station in Bajhang from 1980. The mean annual maximum and minimum temperatures over the preceding 30 years (between 1980 and 2009) were 25.8 °C and 12.1 °C. There was a marked increase in mean annual air temperature during that period in line with local perceptions (Figure 3), with a rate of increase of 0.05 °C/year in the mean maximum temperature and 0.03 °C/year in the mean minimum temperature.

Figure 3: **Mean annual air temperature at Chainpur, 1980–2010**



Source: Data from the Department of Hydrology and Meteorology, Ministry of Environment, Government of Nepal

Impacts of Change on Livelihoods and Community Wellbeing

Food security

Climate variability and change affected livelihoods most markedly through impacts on food production. None of the individual farmers interviewed could sustain their households for more than 6 months from their harvest, and some could do so only for 1 month. Respondents claimed that harvests had decreased drastically due to lack of or untimely rainfall, although farmers in Terhathum felt that thanks to chemical fertilisers, when the rains did come on time, overall productivity had increased. Somfarmers had stopped planting rice and switched to maize, a crop that is less water intensive, or left the land fallow. The World Food Programme (WFP) issued a press release related to this issue in May 2009 claiming that the winter drought of 2008/09 had destroyed crops across Nepal, and wheat and barley production had dropped by 14 and 17%, respectively. Some districts had received less than half the average winter rainfall and had crop yields reduced by more than half (WFP 2009).

Livelihoods

Man from Bajhang showing his yield of yarshagumba (*Cordyseps sinensis*), valued for medicinal uses

Cash crops such as black cardamom, ginger, and broom grass have proliferated in Terhathum, but the decrease in water availability had reduced harvests and thus income. Most communities depend on nearby forests for fuelwood and fodder, as well as for NTFPs that provide an additional source of income. Higher altitude villages across Nepal and particularly in Bajhang depend on the collection of yarshagumba (*Cordyceps sinensis*, also known as caterpillar fungus) which is of extremely high value in eastern medicine. Up to 70% of household income in one village was from yarshagumba. These communities claim that with warmer temperatures and early spring, the caterpillar that hosts the fungus has a shortened life cycle, and it is turning into a moth before the fungus can mature – a threat to this main source of income. However, overharvesting may also be contributing to the problem. Livestock and dairy also provide a crucial supplement to household income, and are affected by the reduction in fodder availability and drinking water for animals. Communities close to markets regularly sold milk, but claimed that milk production decreased when livestock could not be fed fresh fodder due to the lack of rain. Poultry is another insurance mechanism, as both eggs and meat can be sold in times of hardship, but with foxes and illness (jhokraune) plaguing the chickens, even this income was reduced.

Daily life

Climate change also affects other aspects of daily life. Paddy is planted at the beginning of the monsoon, and millet somewhat later. Any delay in the monsoon delays rice planting to the time when millet needs to be planted – and farmers then have to work doubly hard to plant both at the same time. Households that can afford it and are connected to roads can pay for tractors to fetch loads of grass and wood. But most people have to walk several hours to gather these essentials, which increases the workload for women, who are mainly responsible for these activities. Nevertheless, people mentioned that thanks to new technologies such as chemical fertilisers, water taps in villages, and electrification, as well as the construction of roads, overall their workloads had decreased greatly.

With reduced groundwater recharge, springs for drinking water are drying up. Some families in Terhathum have had to migrate due to a complete lack of drinking water. The Food and Agriculture Organization of the United Nations (FAO) has attempted to improve the diets of the rural poor by distributing vegetable seeds, but the lack of water has reduced production.

Residents claimed that stress and other mental tension had increased. With food security already precarious, the reduction in harvest, attributed mainly to climate variability and change, was difficult to bear. Mothers had to worry about being able to feed their children. Alternate livelihoods, whether through wage labour or migration, had to be considered, involving prospects that carry many responsibilities and difficult decisions.

Community-Based Responses to Change

The changes perceived by farmers were not necessarily happening for the first time. However, in the past, floods, landslides, and lack of rainfall would be brief and rare occurrences. Coping strategies were developed for the occasional years in which harvests failed. The changes perceived now seem to be more lasting, and also highly unpredictable. The existing coping strategies are mainly effective in the short term, but climate change will require adaptation through long-term adjustment of livelihood activities.

Erratic rainfall, including delayed monsoon onset, is a challenge for timely planting of millet in Terhathum

The main responses to climate and socioeconomic change in the study area are summarised in Table 9 and discussed in more detail in the following paragraphs.

Responses to erratic rainfall and decreased water availability

Farmers with unirrigated land wait until the rains have started before transplanting rice, as the fields need to be flooded. If the monsoon arrives late, planting of the major summer crops is delayed. When the winter crops fail due to lack of winter precipitation, the summer crops are planted early if there is sufficient rain by then. Maize and other crops that do not produce grain are used as fodder. Millet will not produce grain if there is an extended delay in sowing. However, farmers still planted millet late in the hope of obtaining some yield, and used the stalks as animal feed if there was none. If the harvest seemed threatened, farmers would sometimes sow again, but this depended on the availability and affordability of a second batch of seed and was not a viable coping mechanism for the very poor. Respondents from several villages in Bajhang and Terhathum had stopped planting paddy, due to the lack of water, and either left their fields fallow or planted maize. This was still the case in August 2011. One farmer said that in spite of the good rains in 2011 he had ceased planting paddy, as the spring he used to irrigate his fields had dried out. Farmers in Bajhang had replaced the krisi dhan variety of rice provided by the district agriculture office with ghaiya dhan, an old variety that does not need to be transplanted and requires less water.

Mulching is a traditional way of spreading organic fertiliser composed of dung, leaves, and grass over fields to increase soil moisture and add nutrition to the soil. In order to address the problem of reduced soil moisture, farmers ploughed the fertiliser into the soil immediately after dispersing. They also covered millet seedlings with mulch to prevent them from drying out, and farmers in Bajhang dampened maize seeds before dibbling them deeper into the ground than normal at a depth where moisture is higher.

Table 9: **Community responses to perceived change in Nepal**

Perceived change	Experienced impacts on livelihood systems	Response
Erratic precipitation patterns	Decline in agricultural productivity	Changes to agricultural calendar: delayed or early sowing and harvesting of crops Changes in crop varieties and types Burning forest to gain more land for cultivation (Bajhang) Increased engagement in wage labour Collection of NTFPs (e.g., yarshagumba) Labour migration
	Crop failure	Re-sowing of crops Feed stalks to livestock Buying food from market Sell off assets Take loans
Overall decreased water availability	Less flow in springs and streams, drying up of springs	Stopping paddy planting
	Reduced soil moisture	Mulching Moisturising maize seeds and deep dibble
	Decline in agricultural productivity	As above
Decreased amount or absence of winter rains	Decreased yields from winter crops (decline in agricultural productivity)	As above
Increased frequency of intense rainfall events	Soil erosion and landslides	Building canals to divert water (Terhathum)
Increase in pests and disease	Reduced production	Traditional pest management strategies (spreading cow urine, salt, or ashes; crop rotation and intercropping) Increased use of pesticides
Increasing temperatures	Health issues (increased incidence of heat stroke and vector borne diseases; mental tension)	Collection of medicinal plants
	Beneficial conditions for crops	More than one or shorter cropping cycle Introduction of new crops at higher altitudes (e.g., lychees, mangos)
Warmer and shorter winters with less snowfall	Beneficial conditions for certain crops	As above
	Loss of yields of yarshagumba and thus off-farm income	Increased engagement in wage labour and labour migration
	Increased incidence of pests and disease	As above

Reinforcing traditional farming practices

Farmers in mountainous environments have always had to adapt to variable environmental conditions and have developed many traditional farming practices which can be effective even when conditions are changing fast. Intercropping is one such strategy, with several crops, for example millet or soybean and maize, planted in the same field. Climbing beans are frequently planted in maize fields as the bean roots fix nitrogen and act as a natural fertiliser, while the beans themselves protect the maize to a certain extent during storms. Soybean plants are grown along the ridges of paddy terraces; the roots support the ridges, preventing erosion while providing an additional crop. Another

example is crop rotation. Farmers in Bajhang traditionally plant three different crops – gahat (lentil), mas (black bean used as daal), and til (sesame) – in the same field. They alternate the crops each year to minimise pests and disease, as the crops are affected by different pests, and to improve soil nutrition.

Living with rising temperatures

The rising temperatures are a cause for concern. However, in some areas, the receding snowline and rising temperatures provide an opportunity for agriculture at higher altitudes, and previously unusable areas are now becoming arable land. Residents of high-altitude villages in Bajhang are now able to grow millet in areas where it was too cold to do so before. In Terhathum, it is now possible to grow fruits such as lychee (*Litchi chinensis*) and mango (*Mangifera indica*) that require warmer temperatures and were previously unsuitable for these altitudes.

Dealing with pests and disease

The increased incidence of khurkulo (white grub) was thought to be a result of the lack of rainfall, but was also attributed to mixing of rice husks with the compost fertiliser. With the increase of khurkulo, residents of Bajhang had stopped mixing rice husks with the fertiliser. Thaulya had appeared in millet in the previous 2 years in one village in Bajhang. The disease was observed to spread after weeding, so this practice was stopped to prevent the disease from spreading. Chemical pesticides are also being used to a certain extent, but the high cost deters widespread use. The communities claimed that spraying vegetables with chemicals compromised the taste, so they would use them primarily for cash crops. In order to counteract the increasing use of chemical fertilisers, the district agriculture office in Bajhang had been training farmers to make organic pesticides and promoting their use over chemical pesticides.

Coping with food insecurity

Most households were unable to sustain themselves for the entire year from their harvests and supplemented their income with wage labour and by selling livestock and forest products. When this was still insufficient, they took loans from local moneylenders, generally paying extremely high interest rates. Loans were also taken in the form of credit from stores, and in some places community members could take loans from local saving groups.

The last resort when harvests fail is to start selling off assets, ranging from livestock to property. Unfortunately, this reinforces the cycle of poverty as it reduces future livelihood options. This is the ultimate option, and farmers prefer to take loans than to sell assets. However, in some cases selling off may be unavoidable.

The Public Works Programme of the World Food Programme (WFP) offers an extra source of food and/or income for farmers in far-western Nepal. Roads, irrigation canals, and schools are constructed with local labour, and the workers are paid in rice or cash through WFP's food or cash-for-work programmes. One day of labour is paid in rice, with lentils given monthly.

When the available land is not productive enough, residents of Mayana (Bajhang) sometimes start forest fires to clear new land for agriculture. However, this practice may not be sustainable and could increase vulnerability in the long term.

Diversifying livelihoods

Farmers in Terhathum have replaced maize with different types of cash crops including ginger, cardamom, and broom grass, which can raise a high income if the weather conditions are appropriate. In Bajhang, farmers rely on collecting yarshagumba (*Cordyceps sinensis*) in order to supplement their small incomes from farming or wage labour. In both districts, farmers collected medicinal herbs from forests and sold them to traders. Residents in Bajhang also used to grow marijuana and sell hemp and other products; this was then declared illegal, but some products continued to be sold. In Terhathum, residents from areas near markets sold dairy products, and some farmers engaged in trades such as carpentry to earn additional income. Some better-off families had bought small tea gardens to generate income.

Every community gave wage labour as the first option for an alternative livelihood. As one male farmer (aged 35) from Bajhang noted, "If we don't work for wages, there will be nothing to eat, no fire in the stove". Labour can be in nearby markets or in other countries. The trend of migration to the Gulf and Southeast Asian countries has been escalating. People from Bajhang traditionally migrated to India seasonally to work as labourers. More than 50% of men and close to 50% of the women in one village in Bajhang migrated to support their families. Seasonal migrants travel after the harvest. If the harvest is late they will leave later than usual. If the harvest looks as though it will fail due to lack of water, they will leave earlier.

Differences in Vulnerability and Adaptive Capacity

Socioeconomic and sociopolitical factors also play a role, in addition to the geophysical environment, in determining the vulnerability and adaptive capacity of communities.

The most important factor influencing vulnerability and subsequent adaptive capacity is poverty, which is itself strongly influenced by socioeconomic and political structures such as caste discrimination, lack of education (especially for girls), and lack of decision-making power and economic autonomy for women. These problems reinforce each other, further hindering the escape from poverty (the poverty trap). As the climate changes, subsistence farming becomes less productive, and people become more reliant on finding new sources of livelihood. Women generally lack education and financial assets and must work as wage labourers, but their rates of pay are lower than those of men. Thus the adaptive capacity of women as a group is lower than that of men.

People belonging to the Dalit castes also tend to have a lower adaptive capacity as a group. Traditionally, these people were considered to be 'untouchable' and were limited to low paying professions, for example, tailors, cobblers, blacksmiths, and tanners. They generally have lower rates of education and poorer access to water when the resource is limited. A few are involved in subsistence agriculture, but their landholdings are generally smaller than average. With a smaller resource base, coping and adapting to changes in the climate is more difficult. Furthermore, the reliance on income from services to farmers means that they are affected by farmers' loss of income.

Female farmer from the Dalit group, aged 30 – Khalapata (Bajhang)

"I never went to school and now it's like being blind. We're poor because we do not have enough land. We don't get money from anything except wage labour. My husband has been working in Tamil Nadu for 14 years as a security guard. He sends 3,000–4,000 rupees (NPR) (approximately USD 40–55) every 2 to 3 months. It is never enough for myself, our two small children, and my husband's second wife. We have taken many loans. Whatever we earn is either spent on food or to pay back some of the loans. We sell some vegetables when we can but it is very infrequent. We mainly do wage labour for about NPR 200–250 (USD 3) a day, in addition to working in our field. Harvests have decreased; insects eat the wheat and rice. Mostly there's no water and when it does come it's too intense and our rice rots. What we get from the land is only enough to feed us for a month."

Institutional Opportunities and Constraints

The main institutions operating in the study areas were formal ones, including government institutions and government-aligned and international organisations, and community based institutions such as community forest user groups (CFUGs), leasehold forest user groups (LFUGs), and community savings groups. Unfortunately communities, particularly in the far west, have become dependent on external resources and on initiatives of formal institutions, which are perceived to be endowed with resources. The actions of government bodies are often not demand driven; they are not accountable for their services, and they do not possess the technological, financial, and human resources to inform and support climate change adaptation approaches. Furthermore, processes are lengthy and corruption often limits effectiveness. Effective support to rural communities in tackling the impacts of climate change will require all possible

resources to be mobilised (both human and financial) to raise awareness within institutions of climate change risks and adaptation approaches. Some of the more important formal and informal institutions active in the study area are listed below, together with the associated opportunities and constraints.

Community-based organisations

Community Forest User Groups (CFUGs) and Leasehold Forest User Groups (LFUGs) – These groups have been created so that communities can utilise and protect selected areas of forest and have been quite successful. Such groups could be used as an entry point to raise awareness on climate change among local people.

Community savings groups – These groups had been set up in the study areas in order to help local people become less dependent on moneylenders, who charge exorbitant interest rates. The groups act as social safety nets for farmers and others in times of need and could become even more important if harvest failures become more common.

Government institutions

District development committee (DDC) – The DDC operates government grant programmes for building infrastructure such as bridges, irrigation canals, and drinking water taps. The DDC has allotted grants for tree planting through the community forest user groups.

District agriculture office (DAO) – The district agriculture offices provide information and advice for agriculture, and are especially important in the adaptation process. Farmers currently approach the DAO when problems such as pest infestation and crop failure occur. The DAO supports agroforestry and provides fruit trees so that farmers can grow fruit to supplement income. The DAO has the capacity and resources to gather information and test varieties of crops best suited to the climate.

District forest office (DFO) – The district forest offices assist CFUGs and LFUGs in planting herbs and other income-generating products, and developing plans for forest use. Grass and fodder collected from forests are essential for livestock, which are a key insurance mechanism and livelihood asset.

Government-aligned and international organisations

The Western Uplands Poverty Alleviation Programme (WUPAP) and Environment, Culture, Agriculture, Research, and Development Society, Nepal (ECARDS) – WUPAP operates in the western districts of Nepal as a collaboration between the International Fund for Agricultural Development (IFAD) and the national government and is aimed at strengthening the livelihood systems of the rural poor. ECARDS is WUPAP's counterpart in the eastern districts. These programmes interact with communities on a regular basis, and can play a vital role in communicating the needs of communities to government and non-governmental institutions that have the resources to assist in climate change adaption.

World Food Programme (WFP) and Food and Agriculture Organization of the United Nations (FAO) – The mandate of both of these United Nations organisations is to ensure food security. The approach includes humanitarian relief, support for alternative livelihoods, seed distribution, and farmer training. Activities are helping to buffer the food security situation, which has been compromised by various factors, including climate change. These activities might need to be scaled up as climate change reduces crop yields.

Climate Change Policy

Nepal submitted its National Adaptation Programme of Action (NAPA) in September 2010 (MoE 2010) and the government approved a national climate change policy in early 2011. Local Adaptation Plans of Action (LAPAs) have been drafted to take into account Nepal's wide diversity of ecosystems, micro-climates, cultures, and socioeconomic circumstances (MoE undated) The NAPA recognises that water security is a priority and focuses on broad projects that are likely to reduce vulnerability to climate change. If the measures proposed in the NAPA are implemented successfully,

they could greatly assist farmers in dealing with some of their concerns. However, the NAPA is a relatively short-term project-based approach to climate change adaptation and it will be necessary to consider how to scale up these projects to make them relevant for long-term adaptation. Related services should be provided by the DAOs and DDCs. The proposed activities would require investment and efficiency in government offices.

Conclusion

The main climate-related challenges faced by the communities in Nepal were erratic rainfall, increasing temperatures, and an unprecedented increase in crop pests and disease. The changes were perceived as stronger in the west (Bajhang) than in the east. This may also be related to the fact that the far-western part of Nepal is comparatively less developed and has higher levels of poverty and food insecurity, and thus more limited adaptive capacity. Climate change is aggravating this already precarious situation and may therefore be perceived more strongly by these communities.

Weather patterns in Nepal are extremely variable, and it is difficult to differentiate between normal short-term fluctuations and long-term trends. Nevertheless, there is a clear indication that the variability is itself increasing, that changes are taking place in rain and snowfall and temperature, and that it is increasingly difficult to predict the weather events that affect agriculture and harvests. Thus, diversifying livelihoods and moving away from a reliance on natural resource dependent activities will be unavoidable.

Social inequality is still widespread in the study areas and discrimination of people belonging to lower caste and indigenous groups and women is prevalent. It will be important to overcome this in order to address the problems of the most vulnerable in responding to climate change.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