PROLINNOVA–Nepal

Pilot study on local innovation for climate change adaptation in Nepal

by

Prolinnova–NEPAL Programme

coordinated by

LI-BIRD (Local Initiatives for Biodiversity, Research and Development)

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Background

PROLINNOVA–Nepal is working for the promotion of local innovation in terms of documenting and validating innovations, developing human resources and involving stakeholders in participatory action research/joint experimentation. Its focus is on recognising the dynamics of local knowledge and enhancing capacities of farmers to adjust to change – to develop their own site-appropriate systems and institutions of resource management so as to gain food security, sustain their livelihoods and safeguard the environment. The essence of sustainability lies in the capacity to adapt.

The climate has always been changing since the formation of Earth. In the past, climate change caused the evolution of all life forms. It is a subtext of our economic and social history and understood as a natural phenomenon. From the modernising activities of Man on Earth, climate change has not occurred in a systematic manner and often has erratic patterns. Therefore, current climate change is a central part of the debate about the consequences of human activities on the global environment. If the current climate change pattern will continue, it will cause severe consequences on the Earth's surface including living and non-living things. The future course of the climate may well exert powerful constraints on economic development, especially in developing countries.

Most of the adaptation for agricultural activities is likely to rely on human intervention. Fortunately, farming communities have considerable experience of coping with adverse climatic events, such as droughts and floods. They might have, for example, introduced new forms of irrigation, or diversified to varieties that are higher yielding or have greater tolerance for drought. They might have also changed land topographies. On the whole, people have invented various innovative techniques and practices to cope with the impacts of climate change on agriculture and natural resource management.

Achievements in piloting local innovation for climate-change adaption

1. Literature review

The effect of climate change is a hotcake at present among numerous stakeholders involved in the discussion process. Since the first meeting of the Intergovernmental Panel on Climate Change (IPCC), much discussion, research and fact collection has been done at international level. Despite this fact, there has been little or no work of this type done in developing countries such as Nepal, due to lack of awareness and lack of systematic information related to climate variability. In this context, the PROLINNOVA–Nepal programme started to understand the importance of local innovation to climate change and has a number of activities in its pilot programme. Among these activities, a literature review was the starting point. This was done at different levels, as described below.

Climate variability and change can have a profound impact on the livelihoods and wellbeing of millions of people and should be factored into national social and economic development efforts both at the policy and practical levels. Building adaptive capacity and resilience to climate-related risks is essential to meet development goals, including the Millennium Development Goals (MDGs), which address issues such as poverty alleviation, hunger, access to water and human health, and achieve the objectives set out in poverty reduction strategies. The ability to plan, prepare for, facilitate and implement adaptation measures is determined by various factors, including economic wealth, technology, information and skills, infrastructure, institutions and equity.

Developing countries are particularly affected, as nearly 70 per cent of people live in rural areas where agriculture is the largest supporter of livelihoods. Climate change impacts on environmental and socioeconomic sectors (see Table 1), but technology generation, innovation and adoption do not keep pace with the adverse effects of climate variability. Poor communities are especially vulnerable, as they have limited resource for adaptation and are very dependent on climate-sensitive resources such as local water and food supplies.

Table 1: Climate change impacts in developing countries	
Environmental impacts	Socio-economic resources and sectors affected

• Changes in rainfall patterns
• Increased frequency and severity of: Floods
  o Droughts
  o Storms
  o Heat waves
• Changes in growing seasons and regions
• Changes in water quality and quantity
• Sea level rise
• Glacial melt
	• Water resources
	• Agriculture and forestry
	• Food security
	• Human health
	• Infrastructure (e.g. transport)
	• Settlements: displacement of inhabitants and loss of livelihood
	• Coastal management
	• Industry and energy
	• Disaster response and recovery plans

Among the many sectors of the economy, agriculture is one of the most vulnerable to climate variability and an increased frequency of extreme events. These include direct climate-related threats such as extremes in temperatures and precipitation and changes in the growing seasons, and indirect impacts such as a decline in soil quality, outbreaks of pests and pathogens, and increased risk of fires.

Documenting local perceptions of climate change is also important from a policy point of view, since local perceptions reflect local concerns (Danielsen *et al*, 2005) and focus on the actual impacts of climate change on people's lives (Laidler, 2006), which are dependent on local factors. In addition, local knowledge and perceptions influence people's decisions both in deciding whether to act or not (Alessa *et al*, 2008) and what adaptive measures are taken over in both the short and the long term (Berkes & Jolly, 2001).

The options that farmers have to cope with (increasing) climate variability depend on their actual conditions, which vary greatly in geographic and agronomic terms. For example, traditional practices used to cope with climate risk include intercropping, relay cropping and crop mixtures in semi-arid regions and waterharvesting and conserving soil nutrients in arid conditions. Termite activity is used to incorporate sand, loam and other organic material from the surface into the soil, while creating tunnels within which pockets of water can be retained without being subject to evaporation. Understanding the existing coping and adaptive strategies of farmers in specific geographic contexts is a first step toward the identification of appropriate options to increase the potential for adaptation of particular farmer groups. Local-level analyses can help to: i) highlight the primary constraints to adaptation and the

differential nature of vulnerability of particular groups; and ii) prioritise adaptation interventions and thus facilitate the creation of a more sustainable and equitable production environment (IUCN/IISD/IISDnet, 2004; Wehbe *et al*, 2005*a*).

Adaptation

The IPCC defines adaptation as adjustments in ecological, social or economic systems in response to actual or expected climatic stimuli and their effects (Smit *et al*, 2001). It includes adjustments to moderate harm from, or to benefit from, current climate variability as well as anticipated climate change. Adaptation can be specific action, such as a farmer switching from one crop variety to another that is better suited to anticipate conditions. It can be a systemic change such as diversifying rural livelihoods as a hedge against risks from variability and extremes. It can be an institutional reform such as revising ownership and user rights for land and water to create incentives for better resource management. Adaptation is also a process. The process of adaptation includes learning about risks, evaluating response options, creating the conditions that enable adaptation, mobilising resources, implementing adaptations and revising choices with new learning. We mean all these things by adaptation. But the conception of adaptation as a process is often the most important for formulating public interventions that will have lasting benefits.

Adaptation to climate is not new. People, property, economic activities and environmental resources have always been at risk from climate, and people have continually sought ways of adapting, sometimes successfully and sometimes not. The long history of adapting to variations and extremes of climate includes construction of water reservoirs, irrigation, crop diversification, disaster management, insurance and even, on a limited basis, recent measures to adapt to climate change (Adger *et al*, 2007). Widespread poverty, high reliance on natural resources and low adaptive capacity contribute to conditions of high vulnerability to climate variability and climate change in developing countries (Kates, 2000; Desanker & Magadza, 2001; Mirza, 2003; Dube & Moswete, 2003).

Examples from outside the country

Penehuro Lefale (September 2003) wrote in *Tiempo* # 49 that, before the advent of complex numerical climate models, indigenous communities have used changes in their environments to predict fluctuations in the weather and climate. Social and communal activities such as

feasting, fishing and hunting patterns were planned in response to changes in weather and climate and revolved around the different seasons.

Ben Twinomugisha (September 2003) discussed the merits of indigenous versus scientific adaptation in Uganda in *Tiempo* #57. He wrote that most indigenous Ugandans remain unaware of scientific adaptation strategies for coping with climate change. They have, however, braved the adversity associated with climate variability, and anticipated and responded informally to the direct effects of climate variability. In rural Ugandan communities, indigenous knowledge is an integral part of poor people's lives. It is the basis for decision-making regarding food security, human and animal health, and natural resource management. Local coping strategies provide the foundation for people's own ideas on how to survive during harsh times.

Osman-Elasha (April 2007) noted in *Tiempo* #63 that, in spite of the generally low adaptive capacity of Africa, there are some African communities that have developed traditional adaptation strategies to cope with climatic variability and extreme events. Rural farmers have been practising coping strategies and other tactics, especially in places where droughts recur. For example, in Senegal and Burkina Faso, local people have improved their adaptive capacity by using traditional pruning and fertilizing techniques to double the tree density in semi-arid areas. Trees help in holding soil together, thus reversing desertification. Similar community-initiated projects in Madagascar and Zimbabwe were also regarded as successes.

A group of case studies was undertaken as part of an international project: Assessment of Impacts and Adaptations to Climate Change (Yanda *et al* 2005). The studies identified some of the local techniques commonly used by the people of Tanzania to overcome mosquitoes as an adaptation strategy for malaria. These include sleeping by a fire inside the house to avoid mosquitoes. Burning of eucalyptus leaves and other herbs was reported to be very effective in chasing away the mosquitoes. The studies also noted that many people in the study sites preferred traditional curative measures (local herbs) to treat malaria rather than visiting health facilities.

Examples from inside the country

PROLINNOVA–Nepal did a quick scanning of organisations involved in issues related to climate change. Most of the organisations were found to be involved in research, vulnerability

assessment, strengthening network and awareness-raising regarding climate change. There has been very little documentation of local adaptation to extreme climate variability.

As part of the PROLINNOVA–Nepal activities, Practical Action Nepal had documented already in 2007 the changing of crops to cope with climate change. For example, Pushkar Timilsina, a 21-year-old farmer in Tarai, found that bananas could fetch more money than could paddy from the same piece of land and that bananas are more resilient to changing rain patterns than is paddy. Pushkar had also planted other fruit trees like mango, lemon and grapes to further diversify his crops. He had introduced pineapple as an understorey crop, and he grew fodder on the edges of his field. He grew vegetables under the banana plants for selling at the nearby market. He had also introduced beehives to his banana orchard. Pushkar had noticed the impacts that climate change has on farming and diversified his crops and enterprises accordingly. He recognised that annual crops like rice are more sensitive to climate than perennial crops like bananas. He thought it was important to grow crops that are resistant to climate variables.

Documentation was carried out in the four working sites of a project implemented by LI-BIRD with financial assistance from the Development Fund, Norway in 2008 (Development Fund 2008). This revealed that communities have been using their own traditional methods of adaptation for generations. Local-level adaptation by smallholder farmers was a coping strategy for them to deal with the adverse impact of climate change. Communities were found to take a number of measures to cope with climatic stress and variability. These measures were localised and often lacked comprehensive long-term planning. Waterharvesting was one of the activities carried out by communities to cope with water scarcity in Kalabang, by building a water-conservation pond during the monsoons. Water collected in the pond was used for irrigation in the dry season.

Similarly, farmers from Kalabang of the Pumdi Village Development Committee (VDC) started to cultivate potatoes on a heap of soil in order to conserve the soil moisture. According to farmers, this method is effective in reducing soil moisture loss due to less exposure. Many farmers are now replicating this practice in their area.

2. CLACC NGO Forum meeting

An NGO Forum meeting of the CLACC (Capacity Strengthening in Least Developed Countries on Adaptation to Climate Change) programme was held in the Dragon Hotel in

Pokhara in January 2008. Three partner organisations in PROLINNOVA–Nepal participated and discussed various issues/agendas, including sharing on the documentation work of PROLINNOVA, and outlined some suggestions for future work related to climate-change adaptation. The country programme coordinator shared information about the documentation of innovations related to climate-change adaptation at community level initiated by PROLINNOVA–Nepal. He distributed the innovation documentation forms and requested all the participants to support the documentation work.

3. CLACC South Asia Regional Workshop

Three participants from the PROLINNOVA–Nepal core group and several more participants from the partner organisations of PROLINNOVA–Nepal participated in the CLACC South Asia Regional Workshop held on 19-21 April 2008 at the Yak and Yeti Hotel in Kathmandu. This was focused on adaptation to climate change and the role of civil society in the least developed countries. The workshop was organised by the International Institute for Environment and Development (IIED) and the CLACC programme, co-sponsored by Practical Action and hosted by LI-BIRD.

The objectives of the workshop were to share information on ongoing and planned activities on adaptation to climate change and to develop strategies and plan potential future activities at national and regional level. The workshop was conducted by sharing information combined with group discussion, field visit and an open session with invited guests and speakers. Particularly the group discussion and field visit were found effective in clarifying and elaborating the key issues and concerns raised by the participants.

Forty participants from national and international organisations, including civil society, from the South Asian region participated in the workshop. Dr Saleemul Huq from IIED facilitated the programme. The participants shared and discussed different climate-change issues at local, national and global level. Institutions working on climate change are in various key sectors: community-based adaptation, disaster risk reduction, health, awareness-raising and networking, local knowledge and climate-change policy research.

Of particular importance was the workshop's success in bringing consensus on the urgent need among civil society, national and international NGOs and other relevant stakeholders from the region and beyond on climate-change issues.

The following joint activities were agreed at both country and regional level:

- Strengthening the NGO Forum network;
- Mainstreaming the concept of climate change in the projects of the organisations;
- Developing, collecting, documenting and sharing real cases of adaptation practices at community, district and national level and feeding the information into the key UNFCCC (United Nations Framework Convention on Climate Change) events;
- Designing vulnerability assessment and adaptation projects and figuring out how to do stronger advocacy on climate-change issues;
- Sensitising the media and relevant stakeholders on issues related to climate;
- Capacity building and training for the professional members of the organisations.

4. NGO Forum Meeting

A meeting of non-governmental organisations (NGOs) on climate change was held on 22 November 2008 at RIMS (Resource Identification and Management Society) Nepal in Baireni Dhading, Nepal. The objectives of meeting were to create awareness among the organisations about the Climate Change NGO Group and to allow the participants to share their opinions. In the meeting, there were 24 participants (including 7 women) from 15 different organisations working on climate change in the Central and Western regions of the country. The meeting was started by welcoming all participants; this led to becoming acquainted with the Climate Change NGO Group, its major achievements and future plans. The following issues were discussed:

- Why do we need to work on climate change?
- What should be our position in the COP 14 meeting in Poznan? What are the discussion agenda? And what is our common vision on climate change?
- How do we strategise our actions in future? Inclusion, expansion, actions….
- Action plan for the next quarter

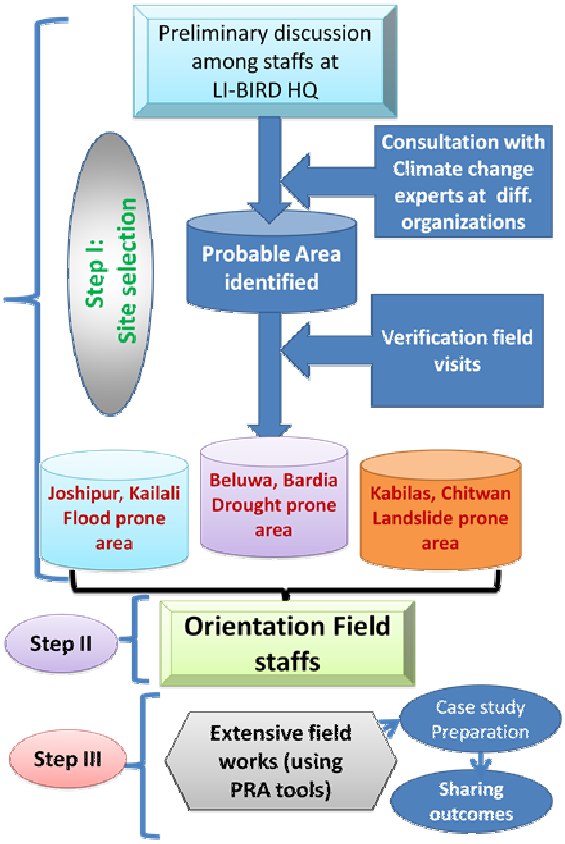
5. Publication of briefing papers on climate change

PROLINNOVA–Nepal worked on local innovation for climate-change adaptation. It is obvious that, unless people or communities are aware about the effects of climate change, there is little scope to work on climate-change issues with them. Therefore, PROLINNOVA–Nepal published climate-change briefing papers in the vernacular language to make farmers and communities aware.

Climate change briefing paper

This briefing paper with the title "Climate change: common problems, concerns and challenges" contains information about climate-change impacts in Nepal (highlighting Nepalese geology, physiographic and climate conditions) in various aspects such as melting glaciers, agriculture (pest incidence, erratic rainfall etc), water resources and hydroelectricity, forest and biodiversity. In addition, it contains information on coping mechanisms at local level in line with adaptation and mitigation.

6. Case studies



In 2008, PROLINNOVA–Nepal team members discussed with programme coordinators and fieldstaff to identify good sites for case studies on local innovation in adaptation to climate change. Based on the literature review and discussion among the LI-BIRD staff members, two sites in the western part of the country were identified where there is clear evidence of the natural hazards of climate events, partly due to climate change. To prepare case studies on different climate events in the Mid-Western and Central regions of the country, extensive work was carried out: site selection for documentation, orientation of fieldstaff on the checklist and Participatory Rural Assessment (PRA) tools for making the case studies, logistics etc, including field visits, as shown in the figure. Two case studies that were prepared from this extensive work are presented in Section 7. The brief notes on local communities' perceptions documented during the field visits are presented below. Community perceptions differed from site to site because of differences in climate events and local conditions.

Local communities' perceptions of climate change

Joshipur, Kailali

Joshipur 3, Bhtteriya VDC of Kailali District was selected as a site for documenting local adaptation practices. These villagers have been affected by floods since many years, and the frequency of flooding has increased in recent years. Some of the indicators of climate change that the farmers of Joshipur shared with the PROLINNOVA–Nepal team were:

- Increase in intense rainfall and frequency of floods;
- Occurrence of flooding in the month of December 1997 due to intense rainfall;

- Changes in monsoon season;
- Paddy field affected by flood: the entire field was covered with sand and silt;
- Stored food grains also destroyed;
- Livestock (goat, sheep, pigs) were also affected;
- Harvested paddy was destroyed;

- Outbreak of diseases like diarrhoea, cholera and conjunctivitis after the flood.

Belwa, Bardiya

Belwa VDC, Ward 3 of Bardiya District was selected as a second site for the documentation. This village is a drought-prone area where the people have been experiencing reduced rainfall during the monsoon season.

The farmers of Belwa were found to be affected by drought. Some stresses experienced by the farmers in the last few years have been:

- Less rainfall during monsoon;
- Farmers rely on rainwater for irrigation, as the community lacks major facilities for artificial irrigation. Most of the years, farmers could not plant paddy due to inadequate rainfall;

- As local varieties of paddy need more water, they could not be cultivated;
- Increase in number of pests and insects that destroyed the crops.

Kabilas, Chitwan

The farmers in Kabilas VDC were prone to landslides every year and were adopting alternatives to cope with such hazards. The PROLINNOVA–Nepal team visited Kabilas VDC aiming to study local innovation related to climate-change adaptation. Other objectives of the visit were: 1) to monitor and supervise the operation of the Local Innovation Support Fund (LISF) provided to a local innovator group; 2) to monitor the LISF support provided to the farmers Pushkar Timilsina and Raghu Nath Lamichhane for their experimentation on "Banana farming to adapt to climate change"; 3) to hold focus-group discussions with women in the innovator group about "Women's role in innovation development"; 4) to plan an exchange visit by the local innovator group to other innovators. The major outcome of the visit was the documentation of local practices to adapt to climate change.

Stakeholder workshop to discuss findings

A stakeholder sharing workshop was held on 12–13 October 2009. It was chaired by Professor Santa Bahadur Gurung from the Institute of Agriculture and Animal Sciences in Rampur, Chitwan. More than 30 people (including 8 women) took part; seven participants (including 3 of the women) were innovators working on climate-change adaptation. The first day of the workshop focused on activities related to climate change carried out by the different NGOs working on these issues in Nepal. The second day focused on the major findings from documenting local innovation for climate-change adaptation. In addition, there were some presentations to increase general awareness on climate change and its impact on agriculture and livelihoods. The objectives of the workshop were:

- To share experience from different individuals' / organisations' efforts working on climate-change issues at local level;

- To share information on the importance of local innovations to adapt to impacts of climate change.

In the discussion session, the active participation of the farmer innovators was impressive and their experiences were good examples of how local communities by themselves are involved in adapting to climate-change effects at local level. In addition to this, the workshop recommended a number of suggestions for taking action, broadly grouped in two categories:

Capacity-building

- Identifying local innovators working on climate-change adaptation and sharing their experience in workshops, meetings, seminars etc;
- Continuous study (sectoral area) on present burning issues – less on quantifying issues;
- Identifying weather manager (*Mausam prabandhak*) for rainfall data recording;
- Empowering local leaders through sensitisation activities, for example, inviting them to join workshops, meetings, seminars, exchange visits etc;
- Capacity building for different stakeholders, including PROLINNOVA–Nepal partners.

Awareness-raising

- Developing information package to distribute;
- Follow-up and sharing information on PROLINNOVA activities at 4–6 month intervals;
- Sharing solid information on climate-change adaptation;
- Compiling climate-change focused innovations for dissemination (example: solid-waste treatment: how it helps in adapting to or mitigating climate-change impact).

7. Documentation of local innovations for climate-change adaptation

Local observations and perceptions should be taken into account in efforts to understand climate change, its impacts, adaptation to it and mitigation of it. Traditional knowledge and practices are the result of centuries of adaptation to existing climatic conditions, but may not evolve as rapidly as changes in climate. Traditional knowledge and technologies to deal with climate variability and extreme events in the agricultural sector are important in many developing countries, which have limited access to new technological advances to reduce vulnerability. Climate-change adaptation in agriculture in the context of resource-poor and marginalised conditions is mainly in cultivation practices and adoption

of new varieties that suit the particular area. In 2009, PROLINNOVA–Nepal was able to document some innovations related to climate-change adaptation, as shown in Table 2.

Table 2: Local innovations for climate-change adaptation

Innovation	Innovators	Location	Brief description	Advantages & disadvantages	Procedure	Dissemination
Garlic cultivation using zero tillage	Jaibik Bibidhata Samrakchan Tatha Bikas Samiti	Kailali	The Tharu communities of Gadariya, Kailai, are cultivating garlic using zero tillage. It reduces cost, as no digging and ploughing are required.	Advantages: • Less cost • A little irrigation is enough • Less compost needed	• Cut paddy from the base • Plant garlic at base of cut paddy • Mulch with paddy straw • Use compost and irrigate as needed	This innovation is being used by farmers in Gadariya, Kanchanpur, West Banke and Bardiya
***Chaite dhaan* (paddy) being planted for 1st time in Western Chitwan**	Om Bahadur Thapa	Chitwan	The innovation was started in 1967. Seeds of CH45 were planted in Mar/April. Innovator got the idea by seeing paddy being cultivated in April/May in India.	Advantages: • Economic benefit • Paddy ripens in June/July Disadvantages: • Infestation by birds and insects • Weeds		
Winter-season paddy cultivation	Kopan Gurau	Nawal-parasi	This innovation was started in 1968. The *taichung* rice variety had been brought by Samiti at Bisnubagar Higher Secondary School. Six households planted it at the rate of 40 kg/ha. Crop grows better in spring water.	Advantages: • Higher production • Faster ripening Disadvantages: • Sometimes hail destroys crop • Disease ("*sete*") and insect pests	Seeds are sown in Nov/ Dec and planting is done in Nov/ Dec.	This innovation is being used by farmers of nearby Dyangri and Sandh villages.
Mixed cropping of red gram and rapeseed (*tori*)	Om Bahadur Thapa	Chitwan	This innovation was started in the year 1973. The innovator got the idea during Indian Army training when he saw wheat and rapeseed being grown together.	Advantages: • Economic benefit • 2 crops can be harvested at once • Less labour needed • Time saving Disadvantages: • Need to be very careful while harvesting • Aphid problem	Red gram and rapeseed are mixed together and sown	No
Growing millet in winter	Sona Raya Yadhav	Bara	This innovation was started in the year 2002. The innovator got the idea after seeing farmers in Chikani Beldari VDC planting millet after harvesting potato.	Advantages: • More production • More planting can be done, as field is fallow at this time of year • Easier planting, storage and weeding than in rainy season Disadvantages: • Irrigation is limiting factor	Seeds are sown in Jan/ Feb, after potato harvest, at rate of 1kg/ 5–6 *kattha* (1 ha = 30 *kattha*); millet ripens in Apr/May. Ploughing and planking is done. Irrigation is given after a month and after flowering. Intercultural operations include weeding and topdressing with urea.	This innovation is being used by farmers of nearby Itwal, Teta, Khajani and Jhawani villages.

Double transplant-ing in rice/paddy	Megh Prasad Devkota	Chitwan	This innovation was started in the year 2000. The innovator started double transplantation in rice after he planted rice in empty spaces in between rice and it grew well. It is useful in lowland with frequent floods.	Advantage: • Higher production Disadvantages: • More labour required	After planting paddy nursery once and uprooting, planting is done again.	This innovation is being used by other farmers of nearby villages by emulating the innovator.
Growing millet in *Chaitra*	Om Bahadur Thapa	Chitwan	This innovation was started in 1967. The innovator got the idea after hearing others say that millet could give better production if planted like paddy. Seed of early-ripening variety is needed.	Advantages: • Greater production • Less labour required Disadvantage: • Does not grow in clayey soil	Seeds are sown at the same time as *chaite dhaan*. Millet ripens in June/July.	No
Planting coriander in fallow lowland	Devraj Sapkota	Chitwan	This innovation was started in the year 2003. The innovator got the idea after group discussion.	Advantage: • Utilisation of lowland (*ghol*)	Seeds are sown a week before harvesting paddy in fallow lowland.	No
Hanging nursery	Manbahadur Pulami	Tanahun	This innovation protects small seedlings from adverse conditions.	Advantages: • Protection from insects/pests • Protection from flood • Protection from animals	Seedlings are kept in a raised bamboo platform with polythene roof.	
Maize variety developed by farmers	Community	Gulmi	It is produced from crossing improved (Rampur Composite) and local variety (Thulo Pinyalo), the former as female parent, the latter as male one. It is sown in the rainy season. Local variety has good taste and higher production but has lodging problem. Improved variety has no lodging problem and is more disease resistant.	Advantages: • Better than local variety • More resistant to disease and lodging and good in taste		Yes

8. Sharing with PROLINNOVA–Nepal Working Group

The findings and experience of the exploratory study on local innovation for climate-change adaptation were shared in a Working Group meeting in late 2009, when the group agreed to work on a new proposal to deepen and expand the work.

References

The list of references can be obtained from Puspa Raj Tiwari, LI-BIRD (ptiwari@libird.org ; puspa.tiwari@gmail.com).