Emerging responses to climate change in pastoral systems

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1. Pastoralism in a changing climate

Pastoralists[4] have a long history of exposure to climatic variability and they have – out of necessity – developed mechanisms to cope with it. The pastoral areas on which they depend are usually arid and semiarid lands with low and erratic rainfall that also varies in terms of space and time. Thus, uncertainty and risk are the rule, not the exception. This variability requires flexibility in resource use (grasping opportunities and coping with shortages) and a high degree of adaptability to constantly changing conditions.

Visible impact of a prolonged drought

The mechanisms used by pastoralists to cope with high climatic variability include moving their livestock and families, keeping different animal species (and, within species, sometimes different types of animals), making reciprocal arrangements with other pastoralist groups for access to pasture and water, developing water-conservation techniques, observing early-warning signs of impending drought and practising complementary livelihood activities (e.g. trade or, where possible, cultivation). Such adaptations and practices were developed long before the concept of 'climate change' became known (McKee 2008).

In addition, it is expected today that countries in the tropics that depend primarily on rainfed farming and/or on pastoralism will be particularly hit by the effects of climate change. For example, the

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[4] *There are no reliable data on the total number of people whose livelihoods depend on pastoralism; estimates vary greatly, partly because the definition of pastoralists varies from country to country. The Secretariat of the Convention on Biological Diversity (2010) gives the very broad estimate that between 100 and 200 million people throughout the world depend on pastoralism. Estimates of the number of pastoralists and agro-pastoralists on the African continent vary between 20 and 40 million. In Ethiopia, where pastoral lowlands cover about 60% of the country, 12-15 million people are thought to live in these areas (MoFED 2006).*

Intergovernmental Panel on Climate Change (IPCC 2007) predicted that, in some of these countries, agricultural production could decline by as much as 50% by 2020. It has also been predicted that, with growing climatic uncertainty, many African crop farmers will increasingly diversify their agricultural activities and will engage more in livestock-keeping (Spore 2008, Rodriguez 2008). In other words, agro-pastoral and pastoral systems may become more important in the future, as the climate changes.

2. The paradox: productive and adaptable yet vulnerable pastoralists

Studies over the last 30 years or so have shown that traditional pastoral systems are relatively productive and represent an ecologically sustainable way of using arid and semi-arid lands. There are indications from a number of African countries (Botswana, Ethiopia, Mali, Mozambique, South Africa, Tanzania, Uganda, Zimbabwe) that traditional pastoral systems can produce up to ten times more food per unit area than can modern ranching (Scoones 1995). This is due to a large extent to the multiple uses of resources and the multiple functions of livestock in traditional pastoral systems.

The Ministry of Agriculture and Rural Development (MoARD 2005) estimates that, in Ethiopia, pastoralists keep about three-quarters of all goats in the country, one quarter of the sheep, one fifth of the cattle and all of the camels. The livestock sector ranks second after coffee in generating foreign exchange for Ethiopia (IIED & SOS Sahel 2010). Pastoral areas not only meet most of the domestic meat demand but are also the main suppliers of livestock for export, generating about US$ 50 million per annum for Ethiopia (Yakob & Catley 2010). Indeed, the actual figures will be even higher, as substantial cross-border trade takes place, which escapes official statistics.

As mentioned above, over centuries, pastoralists have developed successful mechanisms to deal with natural variability in climatic conditions. They therefore have the knowledge, experience and potential to be able to adapt to climate change. However, other factors such as exclusion from traditional grazing areas are creating pressures on the pastoral systems and are increasing their vulnerability to climate change, as they restrict pastoralists' possibilities to adapt. This is pointed out by Devereux (2006) based on his research among Somali pastoralists in Ethiopia: it is not meteorological drought that makes the pastoralists more vulnerable; rather, it is the increasing marginalisation of their drought-response mechanisms. This marginalisation is brought about by restrictions on mobility of animals and people (which may also lead to intensification of conflict), stricter control over cross-border trade (so-called 'contraband'), a land-tenure policy that disadvantages pastoralists, lack of political power among pastoralists, and land-use planners' and administrators' disregard of indigenous knowledge, skills and customary institutions of land-use management (Yohannes & Waters-Bayer 2002, Mebratu 2009). Furthermore, discussions by the authors with different Ethiopian pastoralists over several years suggest that their vulnerability to climate change also depends on some of the following aspects:

- Change in responsibility for herd management to older men, women and children, as young men seek work elsewhere;
- Relative herd size: Pastoralist households with small herds are more vulnerable;
- Livestock species kept: Camels and goats are generally regarded as more drought-resistant than cattle and sheep but, in wetter (e.g. semi-arid to sub-humid) areas, cattle may fare better, because camels in these areas are more susceptible to disease.

When expressing their own perception of their vulnerability to climate change, pastoralists put particular emphasis on the degree of good governance within traditional socio-political institutions and on the land policies of the government, in addition to environmental factors such as drought and floods and associated risks of livestock and human disease.

3. Innovation by pastoralists in adaptation to climate change

3.1 Climate-change study by network on promoting local innovation: Prolinnova

In agricultural development, there is growing evidence (e.g. Reij & Waters-Bayer 2001, Waters-Bayer *et al* 2009) of how local adaptation capacities can be supported by building on the knowledge, interest and innovativeness of local actors. Sometimes referred to as Participatory Innovation Development (PID), this approach brings local people together with external actors, such as researchers and non-governmental organisations (NGOs) and can help accelerate the process of innovation, if these external actors take up a facilitative (rather than a leading) role and leave the local land-users in the 'driver's seat'.

In 2007, the members of the Prolinnova network began to ask themselves: How relevant is the PID approach for supporting local climate-change adaptation? Can interventions to support adaptation to climate change build on local people's innovativeness?

Do farmers already try to innovate, i.e. to find new ways to cope with the challenges posed by the changing climate and – if possible – even take advantage of them? What is the wider potential of the link between local innovation to adapt to climate change, on the one hand, and policymaking related to climate change, on the other?

To start looking for answers to these questions, Prolinnova initiated an exploratory study with funds made available by the Netherlands Directorate General for International Cooperation (DGIS). In 2008, some Prolinnova partners in Ethiopia, Nepal and Niger started to conduct studies into local innovation in the face of climate change, with the overall objective of exploring the relevance of local adaptation and innovation and the PID approach to climate-change adaptation at the local level. More specifically, the studies tried to:

- Systematically document local experimentation processes which come about as a response to a felt need by local people to adapt to climate change;
- Understand local communities' perceptions of 'climate change';

What is PROLINNOVA?

Prolinnova stands for **PRO**moting **L**ocal **INNOVA**tion in ecologically oriented agriculture and natural resource management (www.prolinnova.net) and is a global learning network that was initiated by NGOs but includes multiple stakeholders. It focuses on recognising the dynamics of local knowledge and enhancing capacities of farmers (including forest dwellers, pastoralists and fisherfolk) 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 term 'innovation' broadly refers to the discovery of new and better ways of doing things or modifying an existing way of doing things. It encompasses both incremental and radical changes in thinking, products, processes and/or organisation (Scoones & Adwera 2009).

Prolinnova (2009) makes the following distinction:

- **Local innovation** = process of developing new and better ways of doing things
- **Local innovations** = the new ways of doing things (in terms of technology or socio-economic organisation or institutional configuration) that result from the innovation process.

The Prolinnova network includes about 200 NGOs, governmental research and extension organisations, policymakers, educational institutions and land-user organisations in 18 countries, most of them in Africa. Each country network, coordinated often by an NGO, has developed its own set of activities within the common goal of mainstreaming a participatory approach to innovation development ('PID'). Over the past years, network members have studied numerous cases of local innovation, encouraged researchers and development agents to support these initiatives and documented the experiences for use in policy dialogue.

- Stimulate documentation of innovation (processes) at the local level;
- Draw lessons on the potential impact/influence of local innovation processes on climate-change adaptation policies and programmes.

In Ethiopia, the study was coordinated by the Pastoralist Forum Ethiopia (PFE), a local umbrella NGO which brings together local and international NGOs dealing with pastoral development in the country, in close collaboration with the Geography Department of Addis Ababa University. The study was carried out in Gashamo District in Somali Region, Awash Fentale District in Afar Region and Dasanach District in South Omo Zone in the Southern Region. It focused specifically on innovation by pastoralists in the face of climate change. In Niger, the study was coordinated by the Regional Centre for Agricultural Education (CRESA), a body of the Faculty of Agronomy of the University of Niamey, and was implemented jointly with the National Institute for Agronomic Research (INRAN), two NGOs and the Directorate of Agricultural Development in Maradi Region. The study was carried out in Tahoua, Illéla, Keita and Abalack Districts in Tahoua Region and in Guidan Roumdji, Dakoro and Madarounfa District in Maradi Region. It looked at local innovation in both mixed (crop-livestock) farming and agro-pastoralism. The results of the initial study in Ethiopia were published by Yohannes and Mebratu (2009) and those of the initial study in Niger by Magagi *et al* (2010).

3.2 Pastoralists' emerging responses to climate change

In Ethiopia and Niger, some examples of pastoralists' emerging responses to what they perceived as climate change were:

- **Developing their own cut-and-carry feeding system:** Already several decades ago, the Awash National Park in Afar Region of Ethiopia took over large areas of prime grazing land and waterpoints formerly used by Afar pastoralists. These people have gained no benefit from the income from tourism, and their herds have no official access to the park during dry seasons and droughts. Therefore, frequent violent conflicts between Afar pastoralists and park (State) authorities have taken

Cut and carry feed from national parks

place. Recently, however, some Afar pastoralists have developed their own cut-and-carry system of collecting forage from the park and transporting the forage on the head or in carts drawn by horses or donkeys. This innovation includes collective action by community groups that rent carts jointly, using money contributed by group members, and then distribute the forage within the community. This innovative way of managing forage resources has several benefits: 1) it reduces conflict between the pastoralist community and the State; 2) the cut-and-carry system reduces the risk of disease transmission between livestock and wildlife; 3) the pastoralist community has come to regard the park as a reserve pasture area; and 4) the community has develop a collective financial management mechanism that could serve as a basis also for other economic activities.
- **Settlement around waterpoints:** In some parts of Somali Region of Ethiopia, man-made water sources in the form of below-ground cisterns *('birkas')* are increasing in number and are often privately owned. Many pastoralists have to sell some of their animals to be able to pay for water, which becomes very expensive during drought. However – sometimes with the help of NGOs and government agencies and sometimes on their own initiative – some pastoralist communities

have developed communal sources of water (by harvesting run-off water, digging deep wells or establishing community birkas). This has encouraged some pastoralists to settle at least part of their family – often the women and children – close to the water sources, to have free access to water and short travelling distances for the animals kept near the homes, while other segments of the herd are still moved temporarily to more distant grazing. It remains to be seen whether settlement around waterpoints is an innovation in the sense of a better way of doing things, as problems with water pollution and degradation of land around the waterpoints may arise over time.

- **Purchasing with credit:** During periods of scarcity, some pastoralists have started buying different commodities on a credit basis from small shops (often set up by pastoralists) in the settlements and small towns in the pastoral areas. This mutual relationship between people in the urban and rural areas serves as a new form of safety net in the face of high risks.
- **Changing herd composition:** Because of problems with water, pasture and recurrent drought, pastoralists in both Niger and Ethiopia are increasingly replacing cattle with sheep, goats and camels. There is also an increase in the number of donkeys kept by agro-pastoralists. This is because of the multiple functions of donkeys for drawing water from deep wells, transporting water, transporting goods to and from markets, and as marriage gifts (for example, in Niger, to encourage young women to marry pastoralists living in areas that are not close to waterpoints). Moreover, donkeys are less demanding in their feeding than are other livestock.
- **Settlement on islands in lakes:** In Southern Ethiopia close to the border to Kenya, it was found that, on account of the longer dry seasons being experienced, some Dasanach agro-pastoralists now prefer to stay on islands in Lake Turkana so as to have an easy access to water, pasture and fish, and to face less risk of livestock raiding by other ethnic groups.
- **Diversification of livelihood sources:** In Southern Ethiopia, some ethnic minorities, often called hunters and gatherers, who used to depend almost solely on fishing for their own consumption, have started marketing fish, using modern fish traps they have brought in from the Turkana area in Kenya. They have also begun to rear small ruminants. This is a case of people who were originally non-pastoralists gradually tending towards more pastoralist-like activities.
- **Fodder conservation:** As a complement to grazing of natural pasture, many pastoralists in Niger have started to make hay and to purchase crop residues from farmers and agro-pastoralists.
- **Use of motor vehicles:** In many localities in Ethiopia, some richer pastoralists have sold some of their livestock in order to purchase trucks, which they use in a flexible way to transport livestock for grazing or marketing and to transport marketable commodities for buying and selling. The same trucks are used to load water tanks when the truck owners need water for their own families and herds. They also generate income by transporting water to birka owners. As a result on these activities, the rich pastoralists are becoming even richer.
- **Empowerment of traditional institutions**: In Afar Region, the community underlined that the root cause of their vulnerability is closely linked to the lack of good governance in their local socio-political institutions. Their perception was that the tradi-

Increased rearing of small animals

tional pastoral leaders have – with the attractions of modern and individualistic lifestyles – become corrupt and are no longer accountable to their communities. Accordingly, some pastoralists 'elders' (a term that refers to married men both young and old) have taken their own initiative to build up pressure within the communities to penalise and/or overthrow corrupt leaders. They also work intensively on conflict resolution and have sometimes become successful in negotiating with other ethnic or clan groups to use resources in different geographic locations, at least temporarily during drought and on a reciprocal basis. Generally, these efforts have contributed to improving governance at the grassroots level. This reduces vulnerability of the communities to external threats, including climate-related ones.

3.3 Major features of the local innovations

In general across both Ethiopia and Niger, it was found during the studies that innovation by pastoralists had the following features:

- **Wide range of different types of innovation**: A wide range of different types of innovation was found among the different types of groups depending partly or wholly on pastoralism for a living: by pastoralists and agro-pastoralists that were – depending on context – either minority or majority ethnic groups; this status of relative dominance and power in their home areas affected their freedom to innovate.
- **Group innovations:** Many of the innovations, e.g. cut-and-carry feeding systems, improving access to water sources, reinforcing traditional institutions, have been developed by groups, not only by individuals. This might be attributable to the strong tradition of collective action in pastoralist communities.
- **Multi-functionality of innovations:** Some of the innovations (e.g. using donkeys and trucks, purchasing with credit, empowering traditional institutions) have multiple functions that encompass ecological, economic and social parameters.
- **Diversification of livelihoods**: Many of the pastoralists' innovations are geared to diversifying sources of livelihood and spreading risks.

What was striking – and is possibly due to the fact that all of the researchers involved in this study were men – is that no cases of innovation by women pastoralists were recorded. There is obviously a need for deeper investigation in order to recognise this important aspect of pastoralist adaptation and innovation. In other pastoral areas, programmes such as PARIMA (Pastoral Risk Management) have recorded inspiring examples of how women pastoralists, when faced with climate change and other pressures that threaten the lives of their families, have taken the initiative to form mutual-help groups and to diversify into petty trading, small-ruminant marketing and other ways of generating income (Coppock et al 2009).

3.4 Challenges in understanding local innovation

During the process of trying to recognise and understand pastoralist innovation in adaptation to climate change, the following challenges were encountered:

- **Difficulties in separating climate-change impacts from other pressures on pastoral systems:** The root causes of pastoralists' vulnerability to climate change lie in their marginalisation in decision-making and in the unfavourable government policies. In attempts to address adaptation to climate change, primary attention should be given to these root causes of vulnerability. Focusing only on technical adaptation to climate change would be blind to the still greater and more immediate challenges to the livelihoods of pastoralist communities and could exacerbate the vicious cycle of impoverishment, completing undermining their capacity to survive, let alone adapt.
- **Distinguishing between indigenous practices and local innovation:** Pastoralists have generations of collective knowledge and experience in adapting to ecological and socio-economic changes and have developed an immense wealth of indigenous knowledge and practices to deal with these changes. Their indigenous knowledge system is dynamic. It is characterised by flexibility and adaptability and is strongly integrated into their socio-cultural system. It is not easy to distinguish these practices from more recent processes of local innovation, which is equally a reflection of flexibility and adaptability.

- **Recognising small but possibly important changes:** Because of the heterogeneity of the communities and ecologies in the pastoral areas, it is extremely difficult for outsiders to recognise local adaptation, as these may be only small incremental changes in what might be regarded as 'traditional' practices. Moreover, some innovations may have been developed by only a few individuals or small groups and may therefore remain unrecognised, even though they are potentially important for a larger number of pastoralists.
- **Keeping a longer-term perspective:** Adaptation is a process that deals with both current and future vulnerability and strengthening of resilience. Some forms of adaptation may be good at the current time but not necessarily for the future. This implies that regular assessment needs to be made of the adaptation mechanisms. What will be important is not trying to perpetuate any specific form of adaptation (innovation) to climate change or other pressures that have been developed at a given point in time, but rather strengthening the innate capacity of pastoralists to continue to adapt, in good collaboration with other relevant stakeholders.
- **Keeping pace with fast change:** Very rapid ecological, socio-economic and political changes are taking place at the grassroots in pastoralist systems. Many organisations working at this level are not giving sufficiently close attention to these rapid changes and may therefore be focusing on interventions that have already become outdated, while pastoralists have moved ahead using their own creativity and innovation.

4. Lessons learnt and the way forward

Local innovation in adaptation to climate change needs to be assessed together with other environmental, socio-economic and policy changes. This helps avoid the trap of romanticising locally developed practices as if they were evidence of deliberate adaptation to climate change. The initial scanning of pastoralist innovation in the framework of the Prolinnova studies only partially addresses the complex and diverse issues of adaptation to climate change.

Nevertheless, it is important to give attention to local innovations, because they are sources of valuable new knowledge based on deep-rooted experience of pastoralists. Pastoralists live in areas full of uncertainties and risks to their livelihoods and have therefore always had to experiment and to adapt. Their innovations can bring insights into hitherto unexpected possibilities to adapt to climate change.

There is a clear need to continue investigating how pastoralists are responding to challenges related to climate change, in order to inform policymakers and other stakeholders of the potential role that local capacities can play in local adaptation, and to trigger a process of recognition and reflection. The focus should be not so much on specific innovations, but rather on documenting local innovation as a process. To be sure, at the local level, pastoralists may be able to benefit from knowing what other pastoralists are doing to cope, and then adapting the innovations and practices to their own situations. Disseminating information about pastoralist innovation could stimulate appropriate adaptation by resource-poor communities, as it would help increase their self-confidence and motivation to adapt. Although documentation of innovations is not an end in itself, it remains important as a symbol of the local capacity to react creatively to local problems.

Poor collaboration between researchers and crop farmers has long been criticised, but collaboration between researchers and pastoralists has been even poorer. Recognising local innovativeness by pastoralists provides an entry point for a bottom-up approach to supporting climate-change adaptation, starting with local capacities and ideas. An example is the joint experimentation in Borana Zone, involving pastoralists and formal researchers, that is being started up to test different methods – both 'modern' and local ideas – to deal with bush encroachment in grazing areas (Lemessa Daba, Action for Development, personal communication, 18 November 2009). Rapid adaptation to climate change demands such a multi-stakeholder approach, building on the strengths of each stakeholder group. Recognition of pastoralist innovation could lead to more equal partnership in formal research and development activities. Moreover, the results of such joint innovation processes would

have a higher likelihood of sustainability than would external interventions foreign to the pastoralists. The very process of multi-stakeholder interaction in research and development, starting with recognition of pastoralist innovation and involving also policymakers at various levels, promises to strengthen local capacities to adapt and therefore to cope better with climate change.

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