

# Chapter 9

## Research and Development Challenges in Livestock Production Systems: A Report of the E-Conference

Jeroen Dijkman  
FAO, c/o International Livestock  
Research Institute, Ethiopia

### Background

FAO, ILRI (SLP), CIP (GMP), and ICIMOD decided to organise an email discussion to provide a forum for those who could not be present at the Pokhara Symposium to contribute to the development of a comprehensive livestock research and development agenda for mountain and highland areas. This electronic conference, hosted on the FAO mail-server, ran for eight weeks. The list had nearly 600 subscribers (including other mailing lists) from Africa, Asia, Latin America, Europe, and the United States.

The conclusions taken from the email contributions stress the need to increase household income and human welfare in mountain/highland areas, whilst at the same time ensuring the sustainability of common natural resources. They also emphasised the need for holistic approaches and gender-balanced, participatory planning to ensure socially equitable development.

Strengthening of local institutions is essential to guarantee the empowerment and property rights of mountain and highland populations dependent on livestock, as well as the sustainable provision of services for effective development and research initiatives in these areas.

Highland ecosystems are found on every continent and an estimated ten per cent of the world's population derive their livelihood directly from them. In addition,

billions of people living in the lowlands depend on these ecosystems for resources such as water, building materials, and energy. Highland ecosystems are also important sources of plant and animal biodiversity. In the past few decades, environmental changes and rapid increases in population densities in these mountain areas have meant increased problems for planning effective resource management strategies. Despite the global recognition that these ecoregions received after UNCED in 1992, many highland communities continue to live in extreme poverty, and in many countries they are still socially and politically marginalised.

Livestock are of particular importance to these marginalised mountain farming communities for sustaining their livelihoods. They not only convert crop residues and other plant biomass to products that can be eaten or used by humans like milk, meat, eggs, wool, hides, and draught power, they also play a vital role in mediating nutrient transfers and provide a secure form of investment.

Since the UNCED endorsement of Chapter 13 of Agenda 21– Managing Fragile Environments: Sustainable Mountain Development – FAO, as the Task Manager of this Chapter, has facilitated a number of inter-agency and inter-governmental meetings. These meetings recognised the importance of livestock in highland farming systems. However, there was no clear vision as to how livestock should be utilised best to develop sustainable agricultural systems. The meetings did recommend that any action taken should be participatory, integrated, and interdisciplinary, to encourage interactions between policy-makers, scientists, development agents, and local people. It was in this context that FAO, ILRI, CIP-GMP, and ICIMOD decided to organise the four-day international symposium in Pokhara, Nepal, and set up the electronic discussion group whose results are reported here for the many people working on these issues who would not be able to attend in person.

Reports of the contributions were edited and distributed daily during the eight weeks that the list was open. The email conference was devoted to four separate themes. The results of each are summarised below.

### **Theme 1: Resource Use and Management Strategies in Highland Mixed Farming Systems**

The specific questions raised under this theme were as follows.

- What are the trends in agricultural production and productivity in highland systems where livestock is an integral part of the farming systems?
- How has the growing human population affected the livestock population, animal productivity, and agricultural landholding and productivity?

- What are the linkages among livestock, crops, common property resources, and private land in these highland systems?
- What are the changes taking place in terms of livestock holdings and resource management practices because of the high pressure on land and increasing cropping intensity?

Contributions from the Central South Ethiopian highlands and Southern African highlands stated that significant increases in population have had a significant effect on the availability of communal land (as more land gets taken for crop production) and that this has become the major factor limiting livestock numbers. There has also been a reduction in landholdings per family and a conversion of marginal land for crop production. As a result of the overall reduction in the availability and productivity of resources, animal production has decreased significantly. The intensification on marginal lands has also increased dependency on crop production.

Previously, fallow periods were used to regenerate soil fertility. Manure was used only on vegetable and perennial crops. Currently, however, fallow periods are no longer used, and not even the application of artificial fertilisers can maintain crop yields. Farmers are forced to destroy the natural resources they depend on, as they struggle to survive.

The number of draught cattle has also gone down, as the small plot size and/or the lack of feed resources does not justify owning a pair of oxen. With the loss of these animals, however, other benefits connected to keeping these animals are also lost.

Lack of the development of a rental market, fears of owners that lessees will not treat oxen well, and peak demand problems make access to draught animals in certain areas of Ethiopia even more problematic. It seems likely that these problems will be even worse for female-headed households, as the use of work oxen by females is not generally accepted. Although the use of zero-tillage in these situations could be promoted, stubble grazing is widely practised and tillage is required because of the resultant soil compaction. There are benefits associated with this practise as a result of the voiding of manure and urine by cattle during grazing.

A number of papers and comments dealt with livestock production systems in the Himalayan and Andean regions. Although the specific situations may have differed slightly, these contributions clearly indicated the problems caused in fragile environments through intensified and inappropriate resource use by a growing population. It also highlighted the potential conflicts that may arise between different societal groups that depend on the same declining resource base.



There were also reports that, in some countries, population increase and the expansion of tourism have taken up areas that used to be part of the main grazing areas for ruminant livestock. A project in Nepal, which leases blocks of degraded forest to the poorest farmers and gives these households assistance to regenerate the land in order to increase the natural resource base for the households' exclusive use, has had encouraging results. The number of less productive animals has decreased, and income from livestock products and related products such as fodder has increased. In addition, there has been a massive regeneration of forest species at most of the sites. The system has a positive influence on adjacent forest areas and reputedly halts forest encroachment and shifting cultivation in the areas of implementation.

A number of contributions from Slovenia advocated the introduction of organic agriculture and livestock production to protect the natural resource base and to ensure the sustainability of food production. The same authors also stressed the importance of grass roots' Agenda 21 initiatives, which in their opinion should become the applied framework for any future initiatives in highland areas to protect the environment, and of paying due attention to the social welfare of all people.

The influence of climate change on highland ecosystems was also investigated. The most important changes that may occur in highland areas if current predictions do not significantly change were thought likely to be the following:

- increases in population pressure through the further influx from people from lower altitude areas as the climatic changes make these lower altitude areas less appropriate for human habitation;
- areas at 600 to 1000 masl will become more productive;
- the tree-line will shift upwards;
- weather 'events' will become more severe; and
- there will be continuous changes in nature as a result of the introduction of life-forms from lower altitude ecosystems.

(Reference was also made in other contributions to the occurrence of tsetse flies and malaria mosquitoes at higher than normal altitudes as a result of increases in ambient temperature.)

Farmers in Nepal often sell (or kill) their buffalo calves (even females) so that they do not have to feed them any milk and because feed resources are often limited. This practice, however, reduces the room for selection within local animals. Combined with the lack of systematic work on buffaloes in highland systems per

se, this has made improvements in the prevailing production systems difficult. Nevertheless, when given credit, farmers will preferentially invest in livestock, which shows their importance. Risk, however, is often the overriding factor in any decision farmers make.

Although many local systems of resource management have a proven track record in the protection of communal areas, these systems were not able to protect other forest/pasture areas because of the high population pressure. As a result, tree logging and grazing of forests in some areas of Nepal have become so intensive that trees are degraded and there is no forest regeneration.

Intensification of some highland production systems in Latin America is based on the use of imported concentrates, upgrading from local to exotic cattle, and the extensive application of chemical fertilisers. These systems obviously require large investments and use little local resources. Nevertheless, there are several opportunities in the expanding local markets for the replacement of imports (both inputs and livestock products) and the more efficient incorporation and use of local resources.

With respect to the use of suitable livestock species, there is often a resource mismatch in the highlands and a climate mismatch in the lowlands if exotic species are used. In addition, apart from all the problems related to services and feed resources when highly productive animals are introduced into highland areas, the animals may also experience specific health problems. This was described in a contribution from Colombia, which reported the difficulties that exotic broilers and dairy grade cattle experienced as a result of the sudden and large diurnal variation in ambient temperatures. Introduction of these animals into these environments should be carried out with caution otherwise it may result in high mortality.

A number of papers based on the experiences with poultry development schemes in Bangladesh, stressed the importance of vertically integrated production models (covering the whole production chain) that are based on the grass roots and on indigenous livestock. These contributions also stressed that poultry may be a good 'entry point' as poultry are gender neutral. They do not compete for feed resources with other livestock and thus it may be one of the more immediate ways out of the poverty spiral. The introduction of this 'market-oriented' activity also created experiences and awareness in many other areas. It was stressed, however, that the introduction of these types of models is dependent on the availability of the appropriate infrastructure.

## **Theme 2: Resource Use and Management Strategies in Mountain Farming Systems**

This theme dealt with the same specific questions raised under theme 1, but as they apply to mountain production systems.

The break-up of the Soviet Union in the high altitude areas of the countries that formed part of the communist block has led to privatisation of livestock keeping. This not only resulted in people actually owning the animals but it also meant that all services and the supply of inputs became private overnight. This obviously caused many problems and livestock numbers have decreased significantly. Higher altitude summer pastures in these areas are still underused, as they are far away from the towns, markets, and services. The lower altitude winter pastures, on the other hand, have a very dense grazing pressure.

In the alpine regions of Nepal, the yak population is declining as a result of the following.

- Access to the alpine meadows which used to serve as one of the major feed resources in yak production systems has been restricted as a result of the creation of national parks (tourism).
- Due to the lack of reliable marketing systems, many farmers have given up yak farming and sought employment in towns or the tourist industry.
- Cross-border restrictions do not allow herders to enter the areas that for centuries were a part of their winter grazing lands.

All the above also applies to many other livestock production systems in the alpine regions of other countries in the Himalayan region.

Other contributors suggested that yak owners, who are few, cause damage to a large number of people in the community who depend on the same resources. This is just one example of the conflicts that may arise when the resource base becomes limited. However some people also suggested that the damage caused by yaks has been grossly exaggerated and mentioned new studies that suggest that yak grazing affects only extremely stressed forest areas

The untapped potential of small ruminant production in many remote, high altitude areas was also highlighted. Not only are small ruminants easy to transport, but they can also provide multiple products such as meat, milk, and fibre, although the local markets for these products are often not well developed.

### **Theme 3: Optimisation of the Use of Nutrient Resources in Mountain/Highland Production Systems**

The contributions on this theme related to specific issues of feed and animal nutrition (feeding systems/strategies, cultivated fodder, by products and residues, feed imports from other areas). Integrated and systems-oriented topics dealt with the scope for management of livestock to create more effective linkages between on-farm and off-farm nutrient resources and arable land, and gave a scenario of changing access and availability of common property nutrient resources.

There were contributions that described the constraints posed by the presence of anti-nutritional factors in highland vegetation. In one of these contributions, specific reference was made to tannins, which can reduce intake of roughage as a result of their negative influence on protein digestibility. Tree fodder is often an integral part of feed in highland areas, and most of these leaves have a high tannin content.

Bracken is a ubiquitous plant in the world's highlands. Its consumption causes many syndromes in livestock such as thiamine deficiency and acute haemorrhagic disease. It also affects humans in the Americas and New Zealand through the consumption of toxins via animal products. There are also recently established links between bracken toxins in animal products and certain types of cancer.

### **Theme 4: Policy, Services and Gender**

The specific questions raised under this theme were as follow.

- What are the specific issues/constraints related to the delivery of livestock services in highland/mountain environments?
- What have been the key policy issues in the development of the livestock sector in the highlands?
- How have gender issues been addressed in livestock policy formulation, e.g., in extension service delivery systems and research?
- How has gender contributed to livestock management at household level (gender role in livestock management) and how has this role changed?

Social aspects in general and gender issues in particular have been ignored. Women, however, carry out the most crucial livestock tasks. Livestock are often the only option for poor and landless people to produce a marketable product, and women are generally disproportionately represented in these groups. Women still have very limited access to all types of services (from credit to veterinary services).

With respect to this, the Agricultural Perspective Plan of Nepal envisages a huge change from the norm. It recognises women as the principal managers of natural resources as they play a key role in their sustainable development and exploitation.

In the highlands of South Africa, the withdrawal of subsidised extension and veterinary services has had a significant effect on the adoption and the correct use of technologies. In general, delivery of both veterinary and other services is inadequate or non-existent in highland areas. Although this may be due in part to the lack of infrastructure, many areas are also just neglected by the urban-based policy-makers. From a development point of view, however, it is important to realise that livestock-dependent people are often risk averse, unless good services are made available.

Protection of some areas without benefits of these measures accruing to the community at large, has led to the further exploitation of non-protected areas. There are also significant problems in these areas with what has been called the 'free-rider' effect, in that the benefits that people obtain from collectively managed resources are not being influenced by their actual contribution.

### **Conclusions Taken from the Email Contributions**

Mountain and highland areas have been marginalised in mainstream development. There is a need to recognise the heterogeneity of the different highland/mountain systems and this requires a heterogenic and pragmatic approach. We need both a better understanding of why farmers make the choices they make, and an assessment of resource potentials. This assessment can be used to formulate conservation proposals that balance the requirements of people and resources (optimisation and not maximisation).

Another essential ingredient of the new approach to future developments in highland and mountain environments should be recognition of the multiple roles that livestock perform. The challenge will be to increase household income and human welfare, whilst at the same time ensuring the sustainability of common property resources (CPR). Balancing CPR with private property calls for a holistic approach and participatory planning.

Participatory planning begins with community participation; all stakeholders must be involved from the start. Women need to be included in these planning exercises, which calls for recognition of their unique skills and knowledge. For effective community development, it may be necessary to show the obvious benefits



of what is proposed before people will be convinced. This requires specific strategies that need to be worked out well in advance. In addition, it will be necessary to use a future oriented strategy, i.e., future generations should be involved. Educational and curricular changes may be a way of realising this.

There is an increasing need to look for sustainable and profitable technologies that can reverse the negative trends. To be successful, any development intervention has to take the local situation and the indigenous knowledge base into account. Success also requires an improved understanding of the whole production chain (from education to marketing) and the development of agricultural policies through direct contact with the grass roots' level.

There may be a need to use local animals to fully utilise the genetic variation available within the local livestock populations, to use local resources and decrease reliance on imported products, and to stimulate multipurpose production systems.

Properly functioning services are thought to be an essential requirement to ensure the sustainable development of livestock production systems in highland and mountain areas. Current levels of services are often inadequate and there is a need to formulate simple, integrated programmes that have multiple functions (from extension to the effective marketing of products). Farmers need to be involved in the planning of this. Effective provision of services will be impossible, unless the road infrastructure is developed.

There is also a need to preserve and promote ethno-veterinary practices so that farmers are less dependent on conventional veterinary services. Development of minimum animal health packages and investment into research and development of self-sustaining extension services will be required. In addition, there is an urgent need to further develop human capital through the formulation of a basic plan for education at different levels using existing community-based organisations.

More work will be required to circumvent the inherent nutritional constraints in order to exploit the huge potential of fodder containing tannin and other toxins.

Leasehold forestry has extensive potential in areas from 500 to 2,000 masl. Some comments, however, suggested that this system be integrated with the wider aspects of community forestry to balance the benefits of a few with those of the community at large. It may be necessary to stress the importance of these community approaches and to develop and strengthen local institutions in support of these

initiatives. Franchising of land or forest to a small group of people may be another system worth investigating.

### **List of Contributions Made to the E-Conference**

- Abiye Astatke. Constraints to the sustainable development of highland areas in Ethiopia. 22 October 1999
- Askov Jensen, H. Poultry as an integral part of the highland ecosystem. 7 October 1999
- Brower, B. Comments on the issues raised with respect to yak farming. 3 November 1999
- Contreras, V. Modules of technological applications. 21 November 1999
- Dhakal, B. Comments on Frits Ohler's and D. D. Joshi's papers. 1 November 1999
- Dwivedi, S. K. Livestock health concerns in the Central Himalayan region of India. 7 November 1999
- Ecimovic, T. *et al.* The earth's highlands – today, tomorrow, and organic agriculture – the road to a sustainable future of the earth's highlands agricultural systems in the third millennium. 9 October 1999
- Falvey, L. Comments on Bob Orkov's contribution. 4 November 1999
- Gautam, K. Tree tenure: an opportunity to develop private fodder resources on communal land in Nepal's hills. 9 November 1999
- Hammond, K. Comments on Krishna Gautam's contributions. 22 November 1999
- Hassan Raza, S. *et al.* Small-ruminant production on the alpine ranges of the Trans-Himalayan mountains. 13 October 1999
- Jeggo, M. Comment on Temesgen Samuel's contribution. 11 October 1999
- Joshi, D. D. Impacts of national parks and tourism on yak farming in the alpine Himalayan region of Nepal. 29 October 1999
- Mallia, J. G. Management and disease of small-ruminants in the Maltese agroecosystems. 10 November 1999
- Manrique M., J. and Teran D., M. Animal health lab contributions to the sustainability of dairy systems in mountain areas. 23 Nov 99
- Nell, W. T. Impact of population pressure on natural resources in the mountainous areas of Qwaqwa, South Africa. 14 October 1999
- Ohler, F. M. J. Poverty alleviation through livestock rearing in combination with leasehold forestry in the middle hills of Nepal. 20 October 1999
- Orskov, B. General comments. 4 November 1999

- Pender, J. General comments on policies. 2 November 1999
- Ramirez Nader, L. M. *et al.* A participative research programme to improve the sustainability of cattle production systems in the tropical high Andes of Colombia. 1 November 1999
- Rangnekar, D. V. General comments. 23 November 1999
- Rasali, D. P. Response on comments by K. Gautam. 31 October 1999
- Regmi, P. Comments on the contributions from Hans Askov Jensen. 8 October 1999.
- Saleem, M. Comments on the contributions from Frits Ohler and Temesgen Samuel. 19 October 1999
- Singh, B. Importance of tannins in highland feed resources. 21 October 1999.
- Smith, B. Bracken fern (genus Pteridium) toxicity in mountain regions. 22 October 1999
- Temesgen Samuel. General remarks on the debate of highland issues. 23 October 1999
- Uribe Peralta, A. Comments on the contributions from Hans Askov Jensen. 8 October 1999
- Velez, M. Comments on Bob Orkov's contribution. 7 November 1999.
- Wageningen, N. van. Privatization of animal production in Kyrgyzstan, the Tajik Pamir and the Qinghai-Tibetan plateau. 18 Nov 1999
- Zapata Cadavid, A. system of milk production in the Andean region of Colombia. 21 November 1999