

Highland Livestock Production Systems— Is there a need for specialised livestock product processing and marketing?

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Introduction

It is imperative for livestock production in highland areas that the local land and feed resources can be sustained. For this reason, the challenge of coping with the growing demands of the rising population in highland areas for livestock and livestock products cannot be met by simply increasing the herd size or the total livestock population in the area. In fact it is necessary to reduce the livestock population since grazing land is becoming scarce as a result of the expansion of settlements and use of land to grow crops. Thus the growing demands can only be met by increasing the productivity of single animals. Livestock production in the highlands will focus increasingly on higher yielding meat and dairy animals, more stall feeding, and utilisation of species particularly suitable for specific local conditions (e.g., buffaloes, small ruminants, rabbits, and poultry).

This situation must be taken into account when evaluating the potential in the highlands for the production of livestock products – meat and milk and processed products made from meat and milk - for local consumption and for more distant but economically attractive consumer markets in the lowlands.

Traditionally, livestock products in the highlands cater to the needs of the local population. In highland areas where food crops are scarce, the share of livestock products in the diet may even be above the country average and/or exceed the overall average in developing countries. For example, in Mongolia, the annual per capita

meat and milk consumption is very high (approximately 80 kg for meat and even more for milk and dairy products) but the consumption of food crops is low.

In the highlands, as in other areas, livestock products are most commonly consumed in the form of fresh meat and fresh milk. However, certain processed products with an extended shelf life are prepared for the winter months when fresh meat and milk may not be available. Inedible animal by-products, especially wool, hides, and skins, are used less as highland populations now have access to industrially fabricated items that meet their requirements for clothing, shoes, and the types of housing made from animal products. Many by-products are sold as raw materials for industrial processing if there is a functioning collection system.

Meat Processing

At present only a limited range of processed meat products is manufactured in highland areas. Processing at high altitude is generally done on a small scale, although the processing methods used are the same in principle as in lower more populated and consumer-oriented regions. The higher altitudes favour certain processing techniques, however. A well-known example is the famous dried beef product originating in Switzerland – ‘Buendnerfleisch’. This product is cured and fermented over a long period (up to 4 months). It is considered a delicacy and has the best quality when produced at about 1,500 to 2,000 masl where the air humidity and temperature pattern are ideal. Nowadays, drying in an artificially produced ‘highland climate’ is also common – but the best quality products still come from natural highland drying. This rather costly product is not appropriate to cater for nutritional needs in developing countries, but the product could be of interest for the tourist trade and for export.

Solar drying of buffalo, beef, or goat meat, which takes a few days to a week or so only, is a cheaper method of meat preservation. Some highland areas have a long tradition of preparing such products (e.g., ‘sukuti’ in Nepal, pemmican in North America). These dried products can be used for various meat dishes and soup. The advantage is that they can be stored and transported without refrigeration. Semi-dried processed products have also been developed, in particular from pork, using the natural conditions in highland areas. The most popular product in many parts of the world is semi-dried ham, which in its origins is a product of highland processing, such as jamon Serrano (from Spain), prosciutto di Parma (from Italy) or Jinhua ham (from China). The processing technology for all these products is similar, and in all cases the favourable climatic conditions in the highlands were significant for the development of the technology.

In general, drying is the preferred method of food processing and preservation at high altitudes. The low temperature and low air humidity prevent fast microbiological spoilage. The products quickly achieve values of water activity (a_w) and acidity (pH) that are sufficient to make them shelf-stable even when brought down to lowland areas with a higher temperature and humidity.

Simple but physically adequate methods have been developed for food drying for commercial purposes like the so-called solar cabinet and tunnel drying. These methods are used widely in developing countries with an abundance of sunshine for drying fruit, in particular for export. FAO has modified the method for drying meat with very good results. Meat cut into flat pieces or in strips or chips can be dried easily and hygienically. Refrigeration is not required for storage and transport of the dried meat. The construction costs for the solar dryers, a solar collector, and a drying cabinet are low. The only materials needed are transparent plastic foil and timber, and the energy for the process is free as it comes from the sun.

People in highland regions, as in most rural areas in the developing world, have little knowledge of basic meat processing methods other than simple drying of meat through direct exposure to the sun, which is widely practised. Meat processing using crop/meat mixes can help make meat affordable for the rural poor and considerably upgrade rural diets. FAO has initiated the dissemination of such simple meat processing methods to rural areas, particularly addressing rural women. Assessment of the meat supply practices in different highland regions could lead to the introduction of new meat processing methods that make better use of the locally available meat resources.

Dairy Processing

Product processing and marketing in highland areas are in many cases better developed in the dairy than in the meat sector. Successful dairy processing depends on a variety of factors including:

- the accessibility and nature of markets;
- the availability of milk, surplus to homestead requirements, from a sufficient number of milk producers;
- economies of milk collection and rural infrastructure; and
- the suitability of available processing equipment and training.

There are some highland regions where considerable progress has been achieved in infrastructural development for dairy producers. For example, in the Kenyan highlands more than 400,000 mainly small-scale milk producers not only supply local communities but now access rapidly expanding urban markets, facilitated by

milk collecting systems based on producer groups and a relatively good rural infrastructure (milk collecting centres, electricity, access roads). Since the dairy industry was deregulated in the early 1990s, over 100 small and medium-scale milk processing enterprises have emerged to challenge successfully the monopoly of a parastatal dairy cooperative. These enterprises collect, process, and market a diversified range of specialised dairy products. The shorter life products include pasteurised milk and cultured products while longer life products include butter and cheese – one well-known brand even goes by the name of Highland Cheese.

FAO assisted with a project to develop and introduce short-term vocational and outreach training for these new dairy entrepreneurs and their staff. Women are especially involved, both as owners of processing enterprises and as employees. Small-scale producers and processors are starting to obtain a larger share of the consumer price, even so as much as half the milk marketed in Kenya is still sold through informal markets by intermediaries.

In the high hills of Nepal, the terrain is more difficult. As a result, the rural infrastructure is not as well developed. Producer groups and milk collecting systems are now the backbone of the milk processing industry with over 100,000 small producers delivering milk daily to dairy enterprises. The dairy products have developed along different and more traditional lines. Historically, the key need was to convert milk into products for consumption during the long winter months. Products include 'ghee' or 'ghiu' (clarified butter), made by churning soured milk from cows or buffaloes into butter or from cream after skimming; and very hard cheese-like products such as 'churpi' – usually made from skimmed milk solids. These products are later used in food preparation.

More recently, more specialised western type cheese-making from cow and buffalo milk has been introduced into the high hills, driven in the main by the rapidly expanding tourist market. At even higher altitudes, up to 4,500 m, yak and chauri milk is converted into an increasingly popular niche cheese brand – yak cheese. Here also local 'nauni ghiu' butter is produced, mainly for the traditional butter salt tea – a staple in the high Himalayas.

'Channa' and 'khoa' are very important products in the mid-hills in Nepal, usually produced from cow or buffalo milk, often after full or partial skimming. These are really intermediate products that preserve the milk solids and reduce the volume and weight for transport out of the hills. Channa is then further processed into the local Indian sub-continent soft cheese called paneer, which is also used universally in cooking. Khoa is usually used as the base ingredient for traditional sub-continental sweets such as 'rasagolla' and 'gulabjamun'.

By organising themselves into self-help organisations at the primary or village level to collect milk, smallholders in highland areas in both Kenya and Nepal are now benefiting from regular income from the sale of surplus milk. FAO is contributing by developing a low-cost alternative for collecting milk from remote rural areas with little or no infrastructure. This method is known as the **lactoperoxidase system**; two chemicals are used to boost the naturally occurring enzyme preservation mechanism in milk. Treated milk can be kept for up to six hours before subsequent cooling or processing. Untreated milk starts to sour within one to two hours of milking. The system was developed with Swedish support and has been tested extensively in the field. It is safe and inexpensive and is now used commercially in 10 countries. It has recently received WHO/FAO Codex Alimentarius approval for use when supervised by trained staff at communal collection points such as those used in highland areas. Under certain conditions it also cuts out the need for expensive stainless steel milk chilling equipment.

In the past, intermediaries or middlemen have taken the lion's share of the consumer price for processed dairy products. It is only recently that producers are becoming aware of the opportunities for higher returns from the value added by processing their own milk into longer life products for direct marketing. This is being achieved through collective ownership of secondary level processing and marketing organisations.

Access to Urban Markets

For livestock production in the highlands to be really profitable, farmers will need to focus on providing livestock products to consumer centres in the larger cities in the lowlands, not only on supplying the local population. The dairy sector is more advanced than the meat sector in this respect. As already mentioned, highland dairy producers in some countries where the necessary infrastructure is available supply urban centres with traditional dairy products, and with intermediate products and raw milk channelled through established milk collection systems. Nevertheless, the infrastructure for collection and marketing is not yet satisfactory for many small-scale dairy producers and processors, and there are also many unsolved problems related to equipment. Much of the equipment currently available for milk processing comes from developed countries. It is very expensive, often too complicated, and requires recurrent outlay of foreign exchange for expensive imported packaging materials for the products. It is also unsuitable for processing small quantities of milk efficiently, a requirement for small and medium scale processing units. Furthermore, there is a need to provide the skills and knowledge required to run the processes and the equipment as well as to manage the processing enterprise as a commercial business.

In the meat sector the situation is less favourable for profitable supply to the lowlands. Given the ecological constraints in the highlands, there is often no surplus livestock available to be used for supply to urban centres.

Where meat and or milk are available, there are two main options for the supply to urban centres:

- to carry out processing locally; and
- to transport the livestock/milk to the consumer centres and process there.

The first option has technical and hygienic limitations, although there may be exceptions for some niche products such as traditional cheeses or dried beef and ham. The first problem is that it is often not viable to install adequate slaughter and processing facilities in the highlands. Slaughtering of livestock to provide the raw material for processed meat products would be possible in small-scale abattoirs in the highlands and the meat could also be kept for a certain period without refrigeration facilities as the ambient temperatures are low and the water is generally unpolluted. But it is difficult to transport the products to consumer centres without spoiling. Only dehydrated meat products or products rendered 'shelf-stable' through other preservation methods can be transported without refrigeration. Fresh meat products need refrigeration to prevent them from spoiling. In view of the current infrastructure in most places, and the lack of a cold chain, it is still preferable in most cases to transport the live animals.

Transport of livestock from highland areas to consumer centres also poses certain problems, however. Livestock must first walk to reach roads. Road transport may be complicated by poor road conditions, high mountain passes, and changing weather. In many highland areas, use of unsuitable transport vehicles constitutes a major problem. Improper handling of livestock during transportation, often combined with long transport periods, results in injuries and bruises to the animals as well as weight loss and even death because of the lack of space on the vehicles. There is also the threat of high or low temperature and lack of drinking water. Improving the transport systems is probably one of the main challenges to be tackled in the marketing of highland livestock.

Despite the above constraints, there are clear possibilities for making raising of livestock for meat in the highlands attractive for national and international trade. These include the superior meat quality in terms of good flavour, lean, and the absence of residues and contaminants.