

2 Mountain Agriculture: Different from Agriculture in the Plains

A Conceptual Framework

The types and patterns of agriculture are largely determined by the physical environment (soil, climate, precipitation, slope, altitude, topography); by socioeconomic conditions (roads, transport, markets, knowledge, information, and culture); and by cultural factors of the area (Husain 1986). Mountains differ from the plains both in terms of biophysical and socioeconomic conditions. Biophysical conditions such as high altitude, steep slopes, poor soil, and rough topography make mountains inaccessible, fragile, marginal, and heterogeneous, and impose varying limits on arable agricultural land and the type of crops that can be grown in mountain areas. Inaccessibility, fragility, marginality, and heterogeneity impose heavy limitations on certain types of agriculture. On the other hand, the diversity and suitability of mountain areas for niche agricultural products and services open up unique opportunities (*for details see* Jodha 1992; Jodha et al. 1992).

Farming systems in mountains, even within small areas, exhibit varying degrees of diversity on account of site specificity and variability in microclimatic conditions and these degrees of diversity is matched by varying micro-ecological niches suitable to the cultivation of specific crops and crop combinations. Singh (nd), for example, found 11 different types of farming systems characterised by specific types of vegetation, crops, livestock, off-farm activities, and enterprises in just one area in the Garhwal Himalayas.

Mountain farming systems are complex and diverse and significantly different from farming systems operating under green revolution cover in the plains. In mountain areas, linkages among different farming components such as field crops, livestock, trees, and non-farm activities, are strong compared to lowland agriculture where the linkages among various components are often very low, if not missing. Forests are almost absent in the plains and work animals have been replaced by machines. While in the plains animal power is often replaced by mechanical power, livestock are an important component in mountain agriculture. Mountain agriculture is also largely dependent on intimate knowledge of plants, animals, pests, diseases, and their organic linkages and synergies, while agriculture in the plains is generally dependent on external inputs such as irrigation water, inorganic fertilisers, pesticides, and their supply comes from outside the agricultural sector (Table 1).

Because of these characteristic differences, problems and potentials of mountain agriculture is different from lowland agriculture and, therefore, requires different types and nature of information, knowledge, research, and extension service, as well as mountain-specific policies, strategies, and programmes.

Table 1. Differences between prime lowland and mountain agriculture

Prime lowland agriculture	Mountain agriculture
Main characteristics	
Relatively simple, generally one or two lines of activity; limited crops, predominantly mono-cropping with only a few lines of activity	Complex, diverse, and risk-prone; several lines of activity taking place simultaneously integrating crops, livestock, multi-purpose trees and agroforestry, and growing a variety of crops
Objectives	
Generally aims at market sales and maximising profits	A way of life to enhance diversified livelihood options, mostly aimed at limited domestic consumption
Physical environment	
Low altitude plains, good soil, high potential for intensive agriculture, relatively large and homogenous environment easy for mechanisation and specialisation	High altitude steep slopes, poor soil, wide diversity and heterogeneity and fragile environment, limited suitability for crop-based intensive agriculture, little opportunity for mechanisation, and limited access to markets
Types of input	
External inputs such as HYV seeds, irrigation, inorganic fertilisers, pesticides, insecticides, a variety of machinery and equipment	Little external input, locally produced seeds, high dependency on locally available inputs, high nutrient recycling, reuse of resources - mainly human and animal power-based
Kinds of knowledge required	
Technological operation and maintenance of machines, use of inorganic fertilisers, pesticides, and insecticides	Human and often indigenous knowledge based on rich traditions and a culture of growing plants, animals, fish, conserving soil, growing trees with crops, managing pests and diseases, and reducing risks
Extension services required	
Transfer of modern technology	Transfer of knowledge and understanding about symbiotic interlinkages among components of a farming system including plants, animals, soils, water, sun, pests, diseases, and markets, to bring about more synergies
Kinds of infrastructure required	
Big irrigation infrastructure such as canals, roads, rural banking facilities, processing industry, market and credit facilities	Community-based processing and marketing enterprises, rural banks and credit outlets, marketing information systems, small technological facilities