

## INTRODUCTION

### Background

Agricultural development in Nepal started formally in 1956 with the formulation of the first periodic five year plan. However, based on the resource allocation pattern, the agricultural sector has been accorded the highest priority among all the sectors of the Nepalese economy from the Fourth Plan (1970-75) onwards. More than one-third of the total financial resources of the plan are allocated to this sector. Although various research innovations and their adoptions have taken place in the Kingdom, the overall agricultural performance is not commensurate with the efforts spent in formulating different agricultural development strategies, plans, and programmes in the country, in general, and in the hills and mountains, in particular. The total agricultural production has increased over time owing to the extension of marginal and sub-marginal land, including forests/pastureland. However, the crop yields have declined, particularly in the hills and mountains. Moreover, the production rate has not been able to keep pace with the population growth rate, resulting in decreased per capita foodgrain availability. The inaccessibility of the hills and mountains prevented the surplus foodgrains produced in the *terai* or the plains from being effectively diverted to the region. This situation compelled the planners and policy-makers to emphasise self-sufficiency of the hills and mountains in foodgrain production.

In this context, new improved agricultural technologies (e.g., HYVs that were successful in the plains) were introduced into the hills and mountains. A few exotic breeds were also introduced in order to develop the livestock subsector. However, they were not successful simply because the pre-conditions or required input materials were not available. HYVs are highly responsive to chemical fertilizers, irrigation, and agro-chemicals and these are not easily available in the hills and mountains because of inaccessibility. Farmers did/do not have enough cash to purchase them even if they are made available. Along with the deterioration of croplands, fodder and fuelwood are becoming more and more scarce. This is depicted by the fact that the size of livestock holdings per household is decreasing, although the total livestock population is on the increase. The use intensity of by-products as firewood is increasing. Thus the shortage of food and lack of employment opportunities are compelling people to migrate (seasonally/permanently) from the hills and mountains to the *terai*.

This situation implies that the sustainability of mountain agriculture is seriously threatened. Generally, it has been observed that the farmers' knowledge of mountain farming systems (crops, livestock, forestry, and their traditional resource management practices) is not recorded. An assessment of their knowledge and adaptation practices to mountain environments, conditioned by inaccessibility, fragility, marginality, and diversity may offer some clues. Upon their internalisation, some new openings may arise for revitalisation of sustainable mountain agriculture.

The objective and mandate of the International Centre for Integrated Mountain Development (ICIMOD) is to help promote the development of an economically and environmentally sound mountain ecosystem and to improve the living standards of the mountain populations of the Hindu Kush-Himalayan (HKH) Region, which includes Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan. Among the four thematic research and development programmes of ICIMOD, the Mountain Farming Systems' (MFS) Programme deals with the most complex problems of the HKH Region. Towards this end a large number of MFS assessment has been undertaken, including knowledge reviews, case studies, and field investigations. This document is the outcome of a case study on "Farmers' Strategies and Sustainability of Mountain Agriculture" conducted in the middle hills of Nepal.

## Statement of the Problem

Visible consequences (in the form of landslides, soil erosion, desertification) alone are now drawing people's attention to the question of the fate of mountain people,\* who in the past had not only matched their management skills to the surrounding environment to maintain their livelihood but had also managed to sustain the productivity of the resource base. Data recorded for over one or two decades also indicate that there is a sharp decline in the agricultural productivity of the hills and mountains of Nepal compared to that of the *terai*. There is also a declining trend in the outputs from other natural resource bases (e.g., forests, pastureland). This situation has a direct impact on the degraded quality of life not only up in the hills and mountains but down in the *terai* as well; per capita foodgrains and animal products, have decreased. Ironically, the performance of the agricultural sector\*\* is worsening despite the fact that in terms of expenditure the total agricultural sector has increased by about 14 per cent per annum during the period 1970/71-1980/81. The yields of cereals (paddy, maize, wheat, barley, and millet) decreased by 0.46 per cent and the total production increased by less than 1.0 per cent, mainly because of the expansion in area under cereals by about 1.4 per cent per year during the same period. These are the disguised effects of unsuccessful development efforts of mountain agriculture.

In reality, invisible consequences (widening hunger gap period, increased severity of malnutrition, and other health hazards), although surfacing steadily, also indicate that all mountain areas have been exposed to serious threat on the basic premise of unsustainability. The carrying capacity of the *terai*, which until recently was the area welcoming all those immigrants from the hills and mountains, has also crossed its limit.

Thus the question now comes - what went wrong? Was degradation triggered by human activities or is something beyond it unclear and unanswered. One school of thought attributes the imbalance in the ecosystem mainly to human activities, whereas another school of thought points to the geo-morphological status of the mountains because the mountains are young and fragile. However, general consensus is that both factors are responsible for the degradation of the whole mountain ecosystem. Hence, the former can be controlled to a greater extent while the latter is beyond men's capacity. Therefore, there is an urgent need to understand the resource management practices adopted by the people in order to explore the means and ways to reverse the trend of environmental degradation. It has been speculated that the traditional resource management system, which included agricultural and other activities, was compatible to the surroundings. Therefore, a clear-cut cognisance of the management practices relating to land, water, vegetation, and their dependent activities is a must in order to formulate strategies to be adopted by both private (e.g., farmers) as well as public (e.g., government and corporate bodies) sectors so that mountain agriculture - the principal source of the livelihood of mountain inhabitants - can be developed on a sustainable basis.

It has also been observed that mountain characteristics (e.g., inaccessibility, fragility, marginality, diversity, 'niche', and human adaptation mechanism) are not taken into account during the formulation of periodical plans and programmes. If the attributes of activities (e.g., agriculture and other rural income generating activities) and the mountain characteristics do not tally, the potential benefits cannot be harnessed in a sustainable manner. Research studies to assess the means of checking further degradation should be carried out without further delay. The negative consequences otherwise will not only directly affect the quality of life of the mountain people, but will also have spillover effects in other ecological zones, for instance, in the *terai* area of the country.

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\* In accordance with the ICIMOD mandate, the mountains and mountain people indicate both the hills and mountains and the people from both areas. This document adopts the same approach.

\*\* The agricultural sector includes crops, livestock, forestry, land reform, and irrigation programmes.

## Objectives of the Study

The primary objective of the study was to examine farmers' strategies and the sustainability issues of mountain agriculture. The main focus of the study was on the following specific issues.

- (i) Examination of the importance of the crop, livestock, and forestry components while quantifying their linkages with reference to mountain farming systems.
- (ii) Assessment of indigenous methods of resource management, both private as well as community-based resources, viz., forests, shrubland, grazing land, and pastures including arable land.
- (iii) Documentation of traditional technologies practised by farmers in handling the mountain farming system.
- (iv) Identify the elements in farmers' strategies that helped them maintain the farming system viably and sustainably.
- (v) Appraise the feasibility and viability of those elements in the context of recent changes, such as increased demographic pressure on land, changed market environment, and various institutional and technological changes associated with the development policies and programmes for the mountain region.

## Purview of the Study

The investigation was a site-specific case study that concentrated on the identification of different components of the farming system and the quantification of their linkages. Documentation of the historical perspective of the farming system in relation to resource endowment (e.g., structure, status, etc), production flow, and their use and management was one of the principal components of the investigation. The study also examines and documents various responses that may be referred to as farmers' strategies to government practices, efforts, a changing environment emerging from demographic pressures, technological innovations, and other public policies and institutional interventions. Finally, the study focusses on the "sustainability" elements with a view to strengthening and incorporating them into public programmes for the sustainable development of mountain agriculture.

## Methodological Approach

One of the principal aims of the study was to contribute towards the search for sustainable mountain agriculture. In this endeavour, the major elements behind the unsustainability of mountain agriculture were identified by studying and examining three different mountain farming systems; crop-dominated, horticultural crop-dominated, and livestock-dominated. Then various ways and means to strengthen/minimise the effectiveness of the sustainability/unsustainability of mountain farming systems were explored. The study was conducted in the middle hills of Nepal.