

Chapter 3 . Challenges of Subsistence Hill Agriculture

3.1 Transition of Hill Agriculture

The middle hills of Nepal, and indeed many other parts of these mountains, have passed through different stages of interaction between population, agriculture, and the environment. These stages or periods, despite many complex locational variations, reflect the typical evolution of an agricultural economy. In the early stages of quasi-subsistence conditions, population densities were relatively low in relation to available agricultural land. Agricultural practices were extensive, with widespread shifting cultivation across marginal lands where irrigation development was difficult. Labour utilization rates were low and technology was more or less static. Demand for non-agricultural goods was limited to some basic items and much of it was home-produced. Urban centres were few and far apart, performing largely non-economic surplus extracting functions. Incentive to trade was low because of low agricultural productivity and also because of the relatively limited availability of non-agricultural goods, except perhaps in parts that were unable to grow their own food and had to trade with other regions. Pressure on the environment no doubt existed, but was not very rampant.

This happy state of low-productivity, near-equilibrium conditions did not last for very long. Many quasi-subsistence pocket economies quickly deteriorated. In many cases terracing, development of irrigation, integrating livestock into the farming systems, and even switching over to crops from the New World, such as maize and potatoes, provided important relief for varying periods. Outmigration also provided a temporary safety valve. But it has been only a matter of time before an increasingly large number of pocket economies in the hills have become locked into a Malthusian trap.

Large parts of these hill economies have become virtually stagnant with extensive environmental damage. Incomes have been driven towards basic subsistence, with farm outputs insufficient to even support the family's food needs [Seddon 1987]. Given rapid increases in farm

labour, labour input in the production process has reached a state of low productivity, where many activities are clearly distress engagements.

Technological change from within the system, as a response to growing population pressure, cannot be totally ruled out as farmers continuously make different adjustments. But these changes do not result in any substantial improvement. A few irrigation ditches or improved land management practices, clearly very desirable and important from many aspects, are, however, unlikely to increase production. The most profitable opportunities for productivity increase from within the system are thus severely limited. The closed nature of the system, for all its efficiency in the use of available resources, has also been its greatest setback due to accelerated population growth on account of factors beyond the control of the local hill environment.

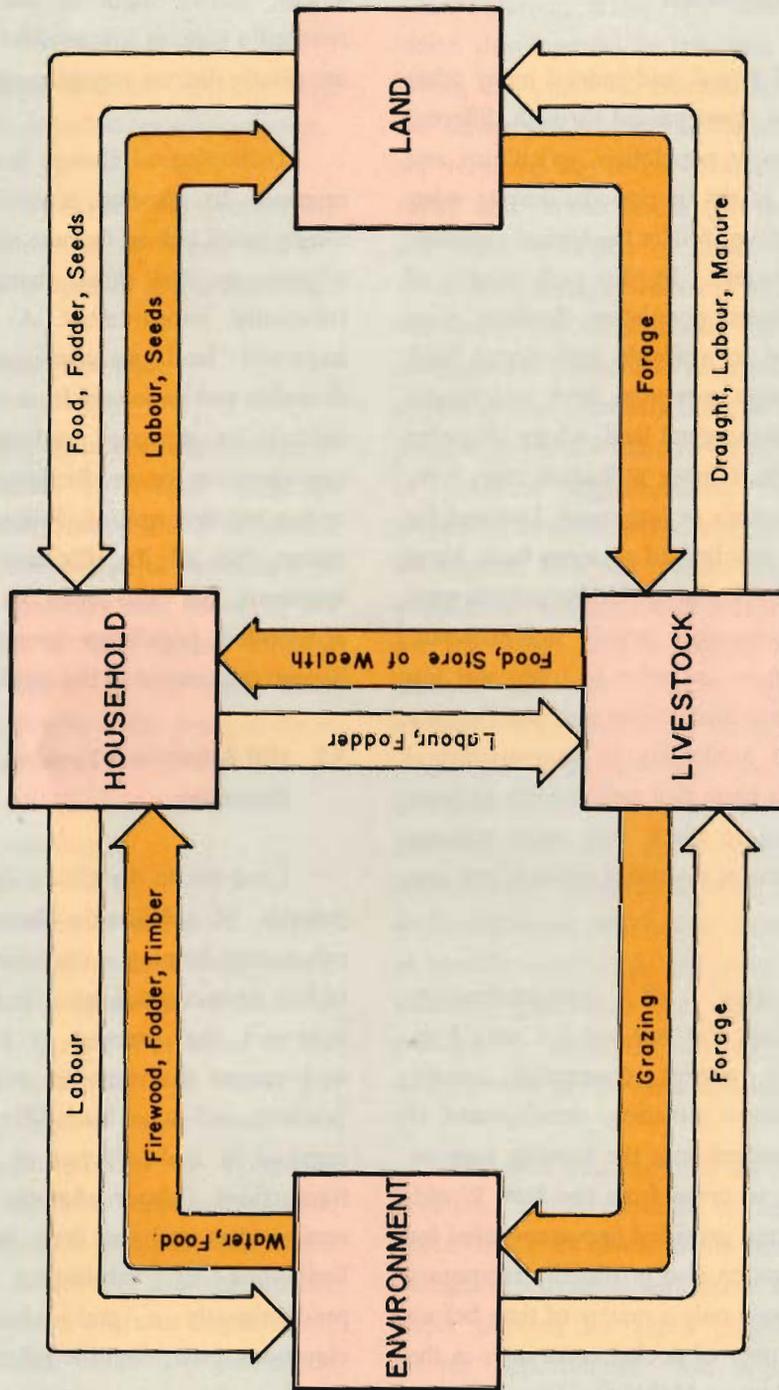
3.2 Hill Subsistence Farming and Land-Based Resources

Land use in the hills is determined primarily by the practice of subsistence farming. The basic unit of subsistence farming is the individual farm, which consists of four main components : the farm household, the land it cultivates, the livestock it holds, and the accessible environment that includes non-privately owned forests, pastures, and other lands [Fig 3.1]. Households are also engaged in limited types of inter-household economic transactions (labour sharing, taking loans, sharing of equipments, etc.) that help in overcoming some of the limitations of subsistence production. There is predominantly a grain-subsistence mentality at all elevations, even when the relative and absolute advantage of other non-grain crops may be greater. This is partly because farmers are leary of engaging in extensive sharing of productive resources necessary to avoid prohibitive risks in the early stages of specialization [Calkins 1976].

Over time, internal pressures on the land resources of farms and on the accessible environment have grown,

INTERACTIONS OF THE SIMPLIFIED SUBSISTENCE FARMING SYSTEMS

Figure 3.1



Source: HMG/SATA Tinou Watershed Management Plan, Kathmandu, 1980, P. 51

with rapid increases in human and livestock population, consequent difficulties associated with traditional fertility management, decreasing fodder and energy supply, and problems of water management [LRMP 1986]. This is probably not an unfamiliar story of agricultural transformation experienced by other areas as well. However, in the case of the hills, several factors have severely limited the inflow of external inputs that could have arrested the productivity decline of hill land resources, made available substitute products for relieving pressures on land, and provided alternative employment and income-generating opportunities. Great difficulties in transport and communication have isolated the hills and mountain areas for centuries from the rest of the world, significantly limiting the inflow of external inputs. Outmigration of hill households has been insufficient to reduce the internal pressures on the fragile land resources of the hills.

Farmer Strategies for Land Resource Management

Farmer strategies for land resource management can be seen from two levels : the farm level, and the community level. The farmer focusses on the management of private lands, while the latter is concerned with the management of non-private land resources. Obviously, the two types of management are highly interactive, with changes in one directly influencing the other.

In so far as farm level resource management systems are concerned, the important question here is how hill farmers have managed land resources and adjusted to changing resource conditions. Building of terraces is one of the most important soil conservation activities that has been going on for centuries, which could have subsequently followed the slash-and-burn phase of hill agriculture, which is still prevalent in some parts of the hills [LRMP 1986 : 4]. There are different types of terraces depending on soil, slope, and climatic conditions. Recently some sources have indicated that cultivated area has not expanded in the hills, but cropping intensity has increased. Forty per cent of the total land area in Nepal is suitable for terraces, but only 15 per cent is being used and many stable terraces are being abandoned in favour of more intensive cultivation [LRMP 1986 : 2-4]. In other areas, farmer responses to increasing shortages and difficulties of fodder and fuel have been to plant more fodder trees and grasses on private fields, stall feeding of animals, sharing of livestock rearing and products, reduction in the number of livestock, use of agricultural residues for burning, and, wherever available, use of chemical fertilizers. All of these adaptive strategies [Table 3.1] indicate increased labour demand for subsistence activities and could mean less labour being available for environmental conservation activities. Some types of conservation activities conflict with the peak agricultural season, while others conflict with off-farm work and seasonal migration. The changing nature of farm labour allocation and the factors underlying them should be evaluated more carefully.

TABLE 3.1: ADAPTIVE STRATEGIES AND LAND-RESOURCES MANAGEMENT OF THE HILL FARMER

STRATEGIES	POTENTIALS FOR EXTENSION
1. Intensive Farming <ul style="list-style-type: none"> - increases in cropping intensity - maintaining terraces - abandoning old terraces - use of HYV technology 	Altitude, technology, fertility constraints in more intensive subsistence farming, need to evaluate other land-use options Use of HYV technology limited by environmental conditions and farm-level resource constraints
2. Increase in tree Crops <ul style="list-style-type: none"> - expansion of horticulture - fodder trees - agro-forestry 	Non-availability of land, knowledge, technical know-how, marketing problems, and inaccessibility
3. Stall-feeding of livestock <ul style="list-style-type: none"> - take better care of the few good ones 	Preference for buffaloes, high costs, burden upon women, risks associated with improved breeds, difficult to get rid of cattle (religion), free grazing still very prevalent, effective where double cropping is practised.
4. Change in firewood consumption and use <ul style="list-style-type: none"> - decrease in consumption - use of improved stoves - use of crop residues - some changes in cooking habits 	Limited supply of substitute/lack of improved technology; cost of other substitutes
5. Migration	Increasingly more difficult to find land

It is difficult to believe that some form of community-level management particularly concerning forest resources, has not existed across the hills. Based upon various discoveries that researchers have made, these management systems have focussed mainly on exploitation and distribution of existing forest resources, and to some extent, on pastures in the Higher Himalayas. The strength of local institutions, as a basis for local resource management and conservation, have depended on one or more factors, such as equality of access to resources, homogeneity of groups, leadership, and the severity of forest depletion, [Molnar 1981; Seddon 1987]. Another category of forests managed by the community are *Guthi* forests (grants to institutions) and temple forests, which are dedicated to local divinities. More recently there has been increasing amount of attention given to development of community forestry, with the hope of encouraging participatory management to develop new forests and protect existing ones [Campbell et al. 1988].

Both these management systems, including various changes discussed, have been relatively unsuccessful in closing the increasing gap in demand and supply of available land resources. While many of these systems worked relatively effectively under low population density conditions, they are encountering major difficulties in high density situations. As government policies clearly have a strong influence on how resources, both private and non-private, are used and managed, it is useful to briefly review the nature of government policies.

Impact of Land and Forest Policies

Land and forest policies of the government in agricultural economies, like those of the hills and mountain areas of Nepal, have had far-reaching effects. Even today over 80 per cent of the labour force is engaged in agriculture-forestry-livestock activities and if any group of policies directly affect the rural population, they are undoubtedly land and forest policies. A review of these policies prior to 1950 and their general emphasis indicates a very long history of government policies that assumed forest resources to be inexhaustible and consequently encouraged deforestation and expansion of cultivation. This is evident from policies that encouraged land grants in lieu of payment, land grants for other obligations to the state, tax incentives to clear new land,

large charcoal levies to villages/groups that had access to forests resources and, systematic alienation of tribal lands. There were no legal provisions for environmental protection or land-use management. After 1950 one notices the introduction of some new policies such as the land reform, changes in land tax and implementation of various forest acts to protect forests.

In 1957 private forests were nationalized, and expropriated without compensation. This was followed by other changes in forest policies regarding forest offenses and penalties (1962), the establishment of National Parks and Wildlife in 1973 and the introduction of Panchayat Forests in 1975. The Soil and Water Conservation Act was passed in 1982. Apart from these legislative measures, there were also changes in forest agencies. The Ministry of Forests was changed to the Ministry of Forests and Soil Conservation, forest offices changed from Division to District level which meant greater manpower and resources for supervision and control. Forestry programmes apart from focus on afforestation, also introduced other programmes such as soil erosion control, promoting improved stoves, fodder programmes, and watershed management.

A review of land and forest policies that have been implemented in the hills and mountain areas clearly indicates that in both cases sustainable management of available land resources has not been the objective of government policy, except very recently. Land and forest policies have been used for a long time in the past simply for generating more revenue for the government, bestowing favours, and extending political support for the regime [Regmi 1976 : 129].

In the past land taxation across the hills was the main source of revenue for rulers in the hills. Consequently there is a very long history of land taxation based more on what could be squeezed from the cultivator than on the productivity or land yield. Although various systems of grading agricultural land has been practiced in the hills for a long time, these systems have always been guided by, and arbitrarily adjusted for fiscal considerations [Regmi 1976 : 131]. Development of proper land use management practices in the hills has not been a focus of land use policy until very recently and, even at the present moment, it is not being enforced effectively.

Policies regarding distribution and ownership of land also do not reveal any trace of governmental concern for improving land management in the hills. Good agricultural land has remained very inequitably distributed. The majority of the hill population have had to eke out a living from steep and marginal hill lands. Inheritance laws did not control excessive subdivision and fragmentation of landholdings, which were already relatively small. For a long time, the government carried out very systematic alienation of tribal lands through grants, taxation, and usufructury land mortgaging [Zeverring 1979 : 102-107]. Another very harmful development, from the point of view of land management, has been the separation of the cultivator from the land owner. Following the 1950 political changes, land reform measures to improve various aspects of land management have been implemented, but these have not gone far enough in changing adverse effects of a long tradition of environmentally unsound land policies. Changes with respect to forestry policy also clearly indicate the lack of concern about proper forest and land-use management. Prior to 1950, management plans for forestry were considered unnecessary since forests were seen as abundant resources. Since 1952 policies have moved from a stage of total control over forests by the government, to partial relaxation of controls including implementation of various programmes to reduce deforestation. There are still no policies directed toward management of livestock and livestock grazing, which many see as a growing menace to limited grazing and forest lands in the hills [Pereira 1986].

3.3 Constraints in Hill Agriculture and Economy

Dispite a very long history of unfavourable land-use policies, hill farmers have developed many different types of innovative strategies. And yet overall scenario for hill agriculture appears very bleak indeed, given the overall trends in almost all key resources [Seddon 1987 : 275- 284; HMG/SATA 1980 : 59-61] Some of these trends may be summarized as follows:

(i) Cultivated Land

- declining fertility, loss of land, increasing soil erosion and partial desertification, major problems of fertility and water management

(ii) Pastures

- largescale overgrazing and degradation of pastures, landslides, livestock management focussing more on numbers rather than on quality

(iii) Forest

- reduced forest area, decreasing forest crown cover, continuing encroachment, overgrazing, loss of species, limited government control on wood harvested, very poor afforestation

(iv) Water

- Increasing shortages, flash floods

(v) Households

- larger households, more dependents, labour scarcity, increasing burden on women, higher proportion of children in the labour force, reduced cultivated area per capita, increasing landlessness, frequent and permanent food deficits, scarcity of firewood, indebtedness, outmigration

- focus on short-term needs that further aggravate medium and longterm problems

- little incentive to cooperate, and breakdown in conventional institutional mechanisms.

(vi) Economy

- rising prices for food, energy and other inputs, political pressures for greater subsidy on inputs, decline in non-agricultural activities due to further concentration on food production, investments for meeting short-term needs at the cost of long term sustainable development, difficulty in mobilizing domestic resources, increased dependence on external inputs

(vii) Environment

- increase in soil erosion, increasing dangers of destruction to roads, bridges, terraces, hydel plants, greater incidence of floods, changes in micro climate, negative downstream effects

Some of these constraints will be examined more carefully below.

a. Agricultural Land Resources

Land is unequivocally the most important asset of hill farmers. Its distribution and ownership patterns, therefore, reveal to a large extent the levels of incomes, consumption, and employment in an agrarian economy.

The average size of holdings in the hills has been reported to be about half a hectare. It has also been estimated that about 10 per cent of hill households are landless. Furthermore, the nature of land distribution in the hills seems to have been less unequal than that in the Terai. Another interesting point in the case of the hills is that the percentage of owner-farmers is greater than in the plains. So much for the general picture. As we examine this issue more closely, drawing evidence from area-specific reports and studies, we find that there are far more disadvantages with regard to land and agriculture in the hills than in the plains.

- i) Although the average size of holdings is 0.59 ha, this is misleading. A majority have even less, with a frighteningly large share of extremely small holdings. In Rasuwa-Nuwakot, one study reports that 52 per cent of the holdings were less than 0.3 hectares [Birgegard 1978].
- ii) In view of the extremely heterogeneous nature of the hill environment, productivity differences of the hill lands vary widely with averages likely to give a very misleading picture of the actual economic position of the hill farmer. Generally, one finds productivity of cereal grains declining drastically as one moves to higher altitudes and also northwards. Hill farmers have evolved various crop combinations to offset some of these locational disadvantages, but major difficulties are being encountered in maintaining productivity levels [Schroeder 1985 : pp 31-34]. There have also been changes in crops and farming practices and most of these measures have resulted in greater use of labour but have failed to increase productivity of either land or labour.
- iii) Agricultural densities are much greater in the hills than in the plains. This places a relatively greater

burden on hill lands than in the plains, forcing hill farmers to use marginal and fragile areas far more intensively than would have been necessary under less dense population levels. But their most serious consequence has been on the environment.

- iv) Hill farmers in every major agroecozone have depended very heavily in the past, on the use of public land resources for supporting their agricultural needs [HMG/SATA 1980]. This in fact, gave them access to greater amount of land resources than was owned by them, and we are only now learning of the intricate arrangements that had been evolved to regulate use of public pastures and forests. More recently, resources available through public lands have not only depleted drastically, but open-access is also being severely curtailed by the government or by the communities themselves. This has effectively served to reduce the amount of land available to the hill farmer. We know little about how these losses or reduced access to public land resources have affected different hill farmer groups in various hill ecozones.
- v) Another constraint for smallholder subsistence production in the hills has been problems associated with the diffusion of improved technology. Much of the improved agricultural technology has been seen as land augmenting. Because of large-scale variations in climate, soil, and other environmental conditions, application of land-augmenting technological possibilities has been more limited in the hills, than in the plains. Thus while smallholders in the plains have been able to offset land size constraints, to some extent, through adoption of HYV technology, many of the hill farmers have not had this opportunity.

b. Problems of Access

Questions of improved access appear in every context of hill development. It has been argued that without improving access, which reduce the cost of moving goods and services, potential for hill development will always remain limited. Reliable and cheap transport is such a critical precondition that many development activities are simply not feasible in its absence. Thus in spite of huge investment and maintenance costs,

transport development in the hills continues to acquire high priority in Nepal's development plans.

More recently, a number of important questions are being raised about the economic justification of transport development in the hills. In different parts of the hills, roads have been in existence for over two decades but there are no signs that improvement of transport has succeeded in transforming the rural hill economy [Blaikie et al. 1976]. Questions have been raised regarding the justification of huge investments for transport development in the hills. It has been felt that investment in other areas, such as agricultural research, development of irrigation, and improvement of natural resources, would have yielded better results. Furthermore, transport development has greatly increased the demand for imports which has further aggravated pressures on foreign exchange.

This is so because transport development has increased the level of trade mainly through imports [New Era 1987]. In many cases, transport development has suddenly displaced many labour-intensive, non-agricultural products through imported substitutes. The impact of roads on the natural environment has also been quite adverse. In view of these factors, including negligible improvements in productivity, justification for further development of road transport in the hills is becoming extremely difficult.

In the context of hill agricultural development, improvement in access can be evaluated in the context of the following issues:

- 1) Diffusion of improved agricultural technology which would help to boost production for domestic demand as well as exports and
- 2) Development of marketing so that the output can reach appropriate markets.

Improving access and diffusion of improved technology are related to some extent, although relationships vary according to the input contents. For instance, development of small scale irrigation, use of improved seeds and adoption of better farm management practices are all relatively neutral, with respect to improved accessibility. If these are beneficial and

available to the farmers, they are likely to be practiced both near the road and far away from the road. The chemical fertilizer story is, however, quite different. Some have reported that fertilizer usage decreases markedly after one day's walking distance from the road [Blaikie 1976]. The situation with respect to fertilizer use in the hills has been summed up by one author as follows:

"Because they (hill farmers) are low on the fertilizer-response curve, hill farmers get a higher crop production response per unit of fertilizer than Terai or Kathmandu farmers, but their yields are lowest because they use such little fertilizer. As their experience with fertilizer increases, hill farmer's demand will increase. The consumption of chemical fertilizer (in nutrients) in hills has increased more than six-fold from 1380 tonnes in 1975/76 to 8280 tonnes in 1984/85. Average per-hectare use is however the lowest (10.3 tonnes/ha) compared to Kathmandu (111.9 tonnes/ha) and Terai (18.9 tonnes/ha)." [Wallace 1986].

Transport costs and related bottlenecks have been seen by many as the major constraint in increased fertilizer use in the hills. Government is already providing a major transport subsidy for fertilizers and many critics maintain that the present fertilizer policy must be revised to reflect its true costs in different regions [Wallace 1986]. An argument in favour of cheaper fertilizer for the hills (either through improved access or subsidy or both) is the growing food deficit in the hills. It is maintained that it is cheaper to transport fertilizer than food into the hills. This argument, however, is based on a number of assumptions that are questionable. First it assumes that hills should continue to produce their own food. The fact that present-day hill farming is dominated by cereal grains with a strong subsistence focus does not necessarily mean that this is the best course for the hills in the long run. Economic activities in various regions should be evaluated on the basis of their comparative advantage, subject of course to the existing constraints. With the development of trading possibilities following specialization transport development is also likely to become economically viable.

Finally, we come to the point that links marketing development with improved access. Improved access only facilitates trade and marketing development, it is not the source of these developments. It is, therefore quite clear

that lack of improved access cannot be seen as the prime factor in the stagnation of hill agriculture. While it might have slowed down the pace of agricultural development (through increased costs of mobility), there are clearly other factors playing a far more critical role. So long as costly transport development is used primarily to support subsistence agriculture, it will continue to raise major questions about its economic viability. Improving access must be strongly linked with major improvements in the entire hill farming systems.

Without sustaining efforts along these lines, costly infrastructure development, not only in transport, but also in energy and other basic services, will be grossly underutilized, increasing the costs for such services and further limiting their demand.

c. Fertility Constraints

Traditional hill agriculture has depended entirely on locally available nutrients for maintaining soil fertility. Although chemical fertilizers are becoming important in areas with improved access, for most of the hills, use of chemical fertilizer is still very limited. Utilizing of all available organic waste and minimizing soil erosion has been the major process through which fertility has been replenished in hill farms [LRMP 1986:31]. The plant nutrient recycling systems, prevalent in the hills, has a number of important components and, of these, three can be singled out: (a) livestock (b) forest biomass, and (c) farm labour. All three are closely interrelated. Reduction in forests has directly affected the supply of leaf litter and fodder, which has further influenced the supply of livestock manure. Similarly, availability of farm labour is also very important as the making of compost and organic manure, including tending of livestock, are very labour-intensive operations. Hill farming is beginning to face major fertility transfer constraints, as the hill farmers put a higher premium on land devoted to food production rather than forests and pastures. With these changes in land use, land and labour constraints are affecting traditional fertility maintenance systems in the hills.

Land constraints figure in two major ways. First, the need to maintain a forest to supply fodder and leaf litter is causing major difficulties. It has been estimated by some researchers that at least 3 ha of forest lands are

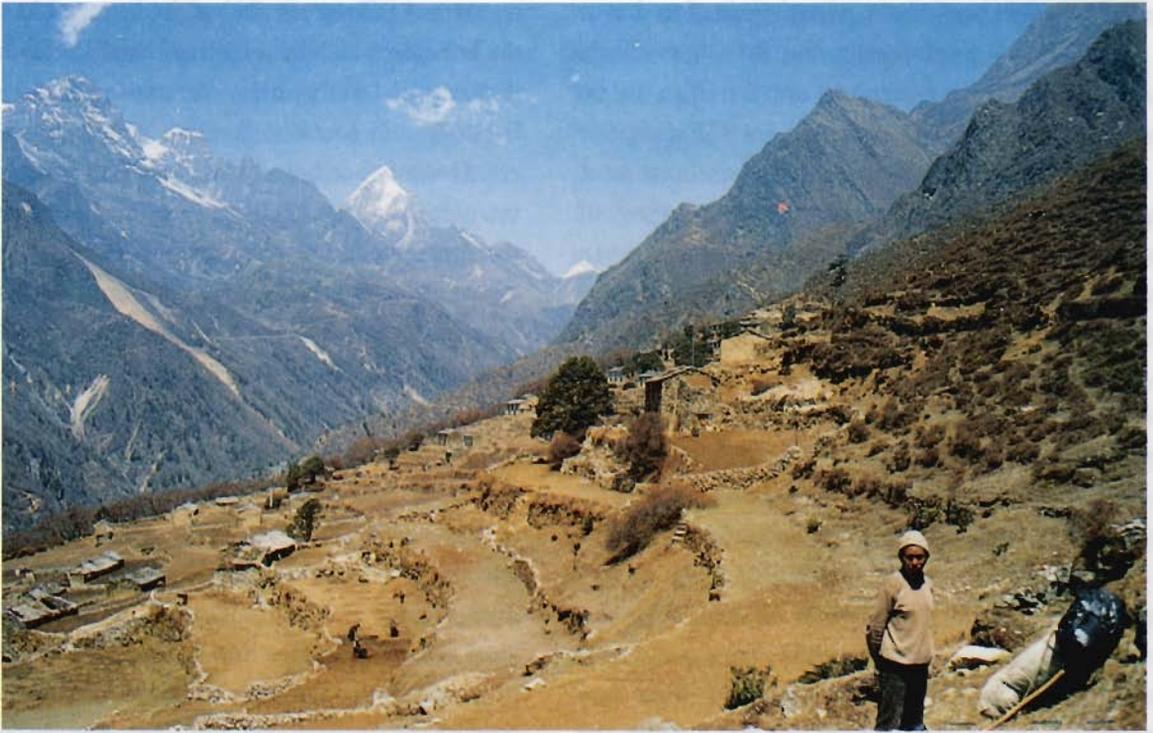
needed to maintain each unit of adult livestock. Otherwise, deterioration in livestock products, including manure, increases markedly [Wyatt Smith 1982]. Similarly, other researchers have suggested that as much as 50 tonnes/ha of leaf litter is necessary to maintain current fertility levels. Even under proper management, this translates to more than a couple of hectares of forest land [Blaikie 1976]. Obviously, more careful research is needed to establish the relationship between productivity changes, forests and pasture lands. But the conclusion is quite clear. In a situation where average holdings are less than half a hectare, and where forests and pasture lands are rapidly declining, land constraints for supporting traditional methods of fertility transfers will soon become very severe. With additional pressures on forests from firewood and timber demand, the problem becomes even more critical.

The next issue is the labour supply constraint. Available evidence indicates that farmers are already making various adjustments to labour supply constraints. For instance, it has been reported in one case that chemical fertilizers are generally introduced into larger land holding. Use of compost peaks at 0.51-10 hectares, suggesting that the increase in area does not make it economical for the farm household to allocate labour for compost preparation where chemical fertilizer is available. Thus increasing cultivated area under relatively constant labour supply tends to decrease the use of compost. Most larger farms in Nepal have to use hired labour. Limitations in the use of compost are created not only by the unavailability of forest biomass but also by farm labour supply [Applegate and Gilmour 1987]. As forests recede further and further from farm households, the labour supply constraints, in terms of time allocations for compost making, affect even smaller farms.

d. Irrigation Development

Further development of irrigation in the hills does not hold much potential. Most easily developed surface water has already been tapped for irrigation. There are many farmer-managed irrigation systems in the hills that are functioning well. There may be some room through better management, for greater harvesting of irrigation water, but the possibilities of easily developed irrigation projects have more or less been exhausted [LRMP 1986].

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(Courtesy : Veit Burger)

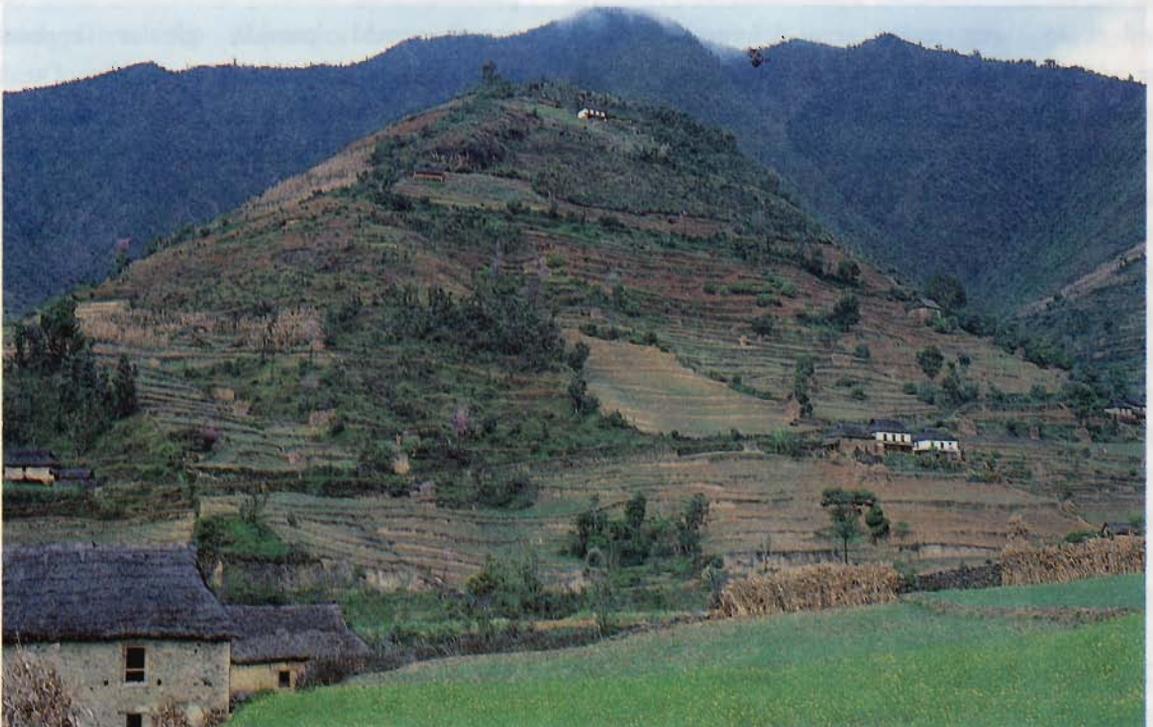
5. Cultivation on Marginal Lands.

Agriculture in marginal lands is becoming increasingly unsustainable both economically and environmentally.

6. Land scape of Subsistence Farming in The Middle Hills of Nepal

The hill farmer is a very good manager of environmental resources but he is unable to cope with the increasing pressures of population.

6



(Courtesy : Kk. Panday)

River tar (flat land above rivers) irrigation has a major potential for development, but is a very costly proposition. Upland river terraces are too high to be serviced by major rivers with perennial flows. Experience with a number of Tar irrigation projects has been most discouraging, particularly from the point of view of economic viability. If large canal construction has been used to divert streams to develop irrigation in some areas, the lift irrigation system has been used in a number of others. Both these alternatives which have involved such massive costs provide good examples of how not to develop hill irrigation. At the same time, a number of other smaller tar irrigation systems, developed with greater people's participation in some parts of central Nepal, have been reported to be functioning very efficiently [MOA 1984]. While there are potentials for small-scale irrigation development in currently unirrigated areas, experience suggests that these are unlikely to be either cheap or relatively easy, under the present farming context. With changes to more high-value crops, greater investment in irrigation development may become economically feasible.

e. Environmentally Unstable Conditions

Environmental concern for the hills has increased to such an extent, that one finds it being raised in almost all writings on hill development. Environmental problems are evident in three major areas-deforestation, soil erosion, and problems of water management. All these three problems are very strongly related with changes in hill agriculture. Deforestation has been related to the growing food, fodder, and firewood needs of hill households [Bajracharya 1983; Yadav 1984]. While a large part of soil erosion across these hills is attributable to natural causes, the role of anthropogenic factors is also believed to be increasing. Cultivation of marginal lands, deforestation, abandonment of old terraces, livestock management systems, and other cultivation practices have also contributed to increasing soil erosion from the hills. Loss of forests and vegetation cover has increased run off, reduced soil moisture and increased problems of water management.

These concerns have resulted in a number of important changes with respect to hill development programmes. There is increasing appreciation of the linkages between hill agriculture and local environmental

resources. Efforts are being made to understand better the linkages maintained by traditional hill farming systems in terms of farming and forestry, farming and livestock, livestock and forestry, forestry and water management, etc. One of the central questions being asked is how to increase the productivity of local resources in an environmentally sustainable manner. Similarly, some concern is also being given to farm-level engineering aspects, to better understand the role of such factors as terracing and soil erosion, terracing and productivity, etc.

Concern with environmental issues has increased the appreciation of local or indigenous resource management systems, and efforts are being made to understand and encourage some of these traditional resource management systems [Mahat et al 1984]. As available local natural resources have a strong relationship with the prevailing hill agriculture, these inquiries can have important implications for the management of hill agriculture. It may be noted that in the context of management of natural resources, the focus of decision-making is the community, and not the individual farm unit. With the emergence of more insights into the breakdown of community decision-making systems, there is a strong likelihood that community decision-making will be revived and strengthened. The impact of this on hill agriculture, in terms of group activities and group planning of agricultural operations, could be substantial as it could provide greater opportunities for specialization, risk sharing, economies of scale in various agricultural operations, and development of agricultural processing and organized marketing in the rural hills. It would indeed be a logical step to extend community-based resource management systems to the organization of improved agricultural systems in the hills. What should be underscored is that concern for the environment should not in any way reduce the support for a stronger diffusion of improved agricultural systems.

3.4 Prospects for Hill Agriculture

One of the most significant aspects of economic transition in the hills and mountains has been change in land use and its capacity to support economic production. Where cultivable land has been limited, communities have developed other economic activities, like trading in the northern mountain areas of Nepal. Even with disruptions in traditional transhumance practices and the

north-south border trade, following the political changes in Tibet after 1950, northern "adventurous traders" have shown great entrepreneurial capacity to adjust and improve their economic situation (Haimendorf 1975). The "cautious cultivators" of the middle hills, on the other hand, are continuing to fight a losing battle by clinging on to their small, fragmented, and unproductive parcels of land. The nature of change in land-use practices and mechanisms of control over land not only epitomise the process of economic deprivation in these hills but will also largely determine the economic future of the hill people. Numerous factors including low productivity, lack of product diversification, disparity in size of land holdings, share cropping systems, absentee ownership, and high rentals have hindered the process of transformation.

The overall landuse pattern as given in the Seventh Plan of Nepal (Table 3.2) has raised doubts about the validity of the earlier land-use figures, so it has become extremely difficult to provide a picture of land-use changes in the hills. It is commonly believed that forest areas have been severely depleted to provide more agricultural land both in the hills as well as in the plains (ADB 1982). Even assuming that agricultural land area has remained the same, which is clearly not true, changes in population during the past twenty years have doubled population densities on cultivated land. Given the disparities in regional endowments of agricultural land and changes in regional population, it can easily be surmised that agricultural densities in the hills and mountains have more than doubled during the past two to three decades.

Trends in production and productivity of land have been equally discouraging. According to the Asian Development Bank, yields of cereal grains have declined by 10.06 and 6.67 per cent respectively in the mountains and hills during the decade of 1971/72 and 1981/82 (ADB 1982 Appendix 1.3). The reasons for the decline include inadequate replenishment of soil nutrients, cultivation of marginal land, reduction in fallow periods, poor extension services and limited purchasing power because of low incomes and small size of holdings. The size of holdings for most people in the hills is too small to meet household food requirements for the whole year. The situation is critical in the hills where the land cultivated per worker is only one-third as much as in the plains. Average sizes of holdings in the hill and mountain areas generally indicate increasing difficulties in supporting food requirements of farm households.

In mountain areas, four per cent of the households are landless but about 60 per cent have holdings below half a hectare. In the middle hills, 2.17 per cent of the households are landless but about 50 per cent have average holdings below half a hectare (NPC 1983, p. 37). Various estimates have suggested that farms under 0.75 ha in the hills are unable to provide for an average family's food requirements (Zevvering 1974, p. 9). Even if there is increased use of labour with smaller-sized holdings, it is important to recognise that there exists a lower economic limit to the size of agricultural holdings and the hill areas seem to have either exceeded or are rapidly nearing this limit. With a rapidly increasing population, the size of holdings will decrease even further. Productive employment and income considerations under existing cropping systems therefore clearly suggest the need for larger holdings in order to be economically viable. Increasing the size of holdings in the hills is possible by either a major displacement of existing landholders or through extension of cultivated area. Both of these options do not appear realistic under present circumstances.

There are possibilities for a major restructuring of the Terai agricultural lands, but it is doubtful how much of this can be used to adjust for hill agricultural households. Landless farm households in the Terai already comprise more than 20 per cent, which is double the present national average. The other option of further extending cultivated area in the hills is likely to be environmentally catastrophic.

TABLE 3.2: PATTERN OF LAND UTILISATION

Land Types	Area (Km ²)	Percentage
1. Agricultural land	26533	18.0
2. Forest	55334	37.6
3. Snow-Covered Areas	22463	15.3
4. Pastures	9785	13.4
5. Water	4000	2.7
6. Settlements and Roads	1033	0.7
7. Others	18033	12.3
Total	147181	100.0

Source : NPC (1985) Seventh Plan, p. 181

It may be relevant to briefly touch upon potentials for wage employment in agriculture in the hills. Available evidence indicates that this is a very small portion of total employment in hill agriculture. Hired labour accounts for only 14, and 20 per cent of the total labour used by farm households respectively for mountains and hills of Nepal (NPC 1983). As all the regions have some landless groups, and much of the hired labour occurs for very short peak periods, there does not exist much scope for any major expansion in agricultural wage employment under the prevailing cropping systems in the hills.

It is therefore fairly evident that far from creating any additional employment, rapid growth in labour force, and prevailing size of holdings will make it difficult to sustain even current levels of employment in the future under the prevailing conditions in hill agriculture.

In spite of this very distressing agricultural employment situation, the non-agricultural options appear to be even more limited. The previous Chapter reviewed the present conditions with regard to off farm employment. While there are many important potentials in this field, it should be underscored that it is very closely related with the development of agriculture. Yadav has argued that even under the most optimistic assumptions regarding expansion of non-farm employment, countries like Nepal will remain predominantly agricultural and rural into the twenty first century (Yadav 1986). From many alternative considerations a healthy agriculture appears to be major precondition in economies where agriculture already employs a large part of the population. The general experience regarding enhancements in agricultural productivity indicate that without substantial investment in irrigation, research and extension, improvement in accessibility to link with urban areas and marketing condition, a major breakthrough is quite unlikely. Hill agricultural investments on these infrastructures have not as yet reached the critical levels capable of generating sustained changes. The fragile and rugged environment of

the hills further complicate the nature and magnitude of these investment packages. However once the process starts, it can lead to significant developments in off-farm activities as well. There is no reason to believe that the "green revolution" cannot be brought about in many parts of the hills also, particularly in low land areas where irrigation can be developed. It is already happening in many small pockets of the hills. At the same time very little work has gone into the development of market oriented multiple cropping systems in which the hills have a distinct comparative advantage vis-a-vis the plain areas. The hills have distinct advantage for many agricultural products on account of their physical conditions and yet very little of this potential has been evaluated in terms of investments and their overall income and employment effects. In view of the growing poverty and pressures on natural resources arising out of conventional farming practices, it seems increasingly evident that hill agriculture must concentrate on those cropping systems where its comparative advantage is the greatest.

Many of the characteristics associated with hill agriculture (small holdings, intensive use of labour and land, etc.) can be utilized profitably if economically superior crop combinations and the necessary support services are made available to hill farmers. Conditions have reached a stage where hill farmers will accept changes that can be demonstrated to improve their economic conditions. There are many things that are lacking in hill agriculture, but this is true of all agriculture. If change is to come about, it cannot wait until all the conditions have been met. Many of these so-called preconditions reflect different stages of development itself. It is thus important to identify a number of effective entry-points, and to concentrate initial efforts on developing these. Later on, other problems can be dealt with at appropriate stages. The next Chapter will elaborate upon some of these issues regarding market oriented development of hill agriculture.