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A Case Study in the Sikles Area, Gandaki Basin, Nepal Himalaya

This paper examines the extent, causes, and consequences of abandonment of agricultural land near the village of Sikles in the Nepal Himalaya. Socioeconomic information was collected in a household survey. Abandoned agricultural land and geomorphic damage were mapped at plot level for an area of 149.6 ha. Plot-level analysis showed that nearly 49% of all khet *land and 37% of all* bari *land had been abandoned. About 10% of all* khet *land had been completely damaged by landslides and floods. Nearly 41% of all abandoned plots were subjected to different forms of geomorphic damage. The amount of geomorphic damage on plots abandoned earlier is greater than that on plots abandoned recently. Abandonment of agricultural land does not automatically lead to plant colonization because geomorphic damage is intensified prior to colonization. Abandoned land requires further management for plant colonization as well as for reducing the risk of geomorphic hazards. Prevailing government policies and acts are not effective in managing abandoned land. The phenomenon of abandoned agricultural land observed in the Nepal Himalaya is not unique: it is common in many mountain areas in the world. However, this phenomenon has recently led to pronounced socioeconomic and environmental problems in Nepal.*

Keywords: *Agricultural land; accessibility; abandonment; geomorphic damage; land management; Himalaya; Nepal.*

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Introduction

Abandonment of agricultural land has been a commonly observed trend in rural mountain areas in many parts of the world since the 1940s (Walther 1986; Garcia-Ruiz and Lasanta-Martinez 1990; Harden 1996; Kamada and Nakagoshi 1997; MacDonald et al 2000; Romero-Clacerrada and Perry 2004). The commercialization of agriculture through technological development and increased off-farm activities resulting from industrialization and urbanization in accessible lowland areas has motivated many mountain farmers to migrate, either temporarily or permanently. Depopulation due to high rates of outmigration, reduced scope for enhancement of productivity in traditional agriculture due to fragile mountain environments, reduced economies of scale due to highly fragmented and diversified biophysical conditions, and resistance to adopting modern, market-oriented farming practices by mountain people are some of the reasons for the growing trend of land abandonment (Walther 1986; Vogel 1988; MacDonald et al 2000). Abandonment of agricultural land constitutes a depreciation of environmental capital stock and has many, mostly negative, socioeconomic and environmental consequences.

In the past, conversion of forestland to agricultural use, taking place even on steep mountain slopes and at an increasing pace as a result of rapid population growth, was considered one of the main causes of growing environmental degradation and poverty in the Nepal Himalaya (Eckholm 1975). After an extensive review of studies in the 1980s, Ives and Messerli (1989) challenged this theory of Himalayan environmental degradation and showed that forests in hill and mountain areas have remained more or less intact, despite rapid population growth after the 1950s. Ives (2004) further highlighted the positive impact on geomorphic processes due to modification of hillslopes for agricultural use through terrace construction and runoff management by local farmers mobilizing a massive labor force. Smadja (1992), in her study of the Middle Mountains of Nepal, also concluded that intensive cultivation of mountain slopes with extensive maintenance ensures retention of a high degree of stability, while de-intensification leads to poorer maintenance and thus to slope instability.

Recently, an increasing trend towards de-intensification and abandonment of agricultural land has been reported from many parts of the Nepal Himalaya (Virgo and Subba 1994; Adhikari 1996; Jackson et al 1998; Thapa 2001; Khanal 2002). In some areas more than 30% of total cultivated land has been abandoned (Thapa 2001; Khanal 2002; Gautam 2004). This is quite a significant proportion of land left idle. This land abandonment has a tremendous impact on food security and local livelihoods, in areas already suffering from mass poverty and food deficits. It also has several negative consequences for hillslope processes, where hillslopes have been terraced and managed through massive inputs of labor.

The present article examines the processes, causes, and consequences of abandonment of agricultural land near the villages of Sikles and Parche in Nepal (Figure 1). It also recommends policy measures for sustainable use of such land.

Study area

The study area is located about 24 km northeast of Pokhara, one of several rapidly growing towns in Nepal

FIGURE 1 Example of geomorphic damage on abandoned agricultural land in the study area. (Photo by Narendra R. Khanal)

(Figure 2). Altitudes in this area range from 1100 m to 3331 m. The lower part below 2000 m lies in the warm temperate zone with mean annual temperatures between 15 and 20° C, while the upper part lies in the cool temperate zone with mean annual temperatures between 10 and 15° C. The average annual precipitation is 3700 mm; more than 75% of total annual precipitation occurs during 4 summer months (June–September), with an average of about 187 rainy days per year.

There are 2 villages in the study area, Sikles and Parche, with a total of 424 households and 1963 inhabitants in 2004. The main ethnic group is Gurung (more than 78% of all households). The remaining households belong to occupational castes such as the Damai, Kami and Sarki.

Steep hillslopes in the lower and middle parts up to 2000 m have been terraced and brought under agricultural use. The upper slopes are mostly covered with forest. Other land use and land cover types in this area are shrubland and grassland (Figures 3A and 3B).

Methods and materials

Two types of survey were carried out for this study. First, a household survey was conducted at village level in 1999/2000 to obtain information on socioeconomic conditions. A structured questionnaire was prepared to record relevant information. A total of 78 households were randomly selected from the 2 villages for interviews. Second, a plot-level survey was carried out covering 640 agricultural plots to study trends of land aban-

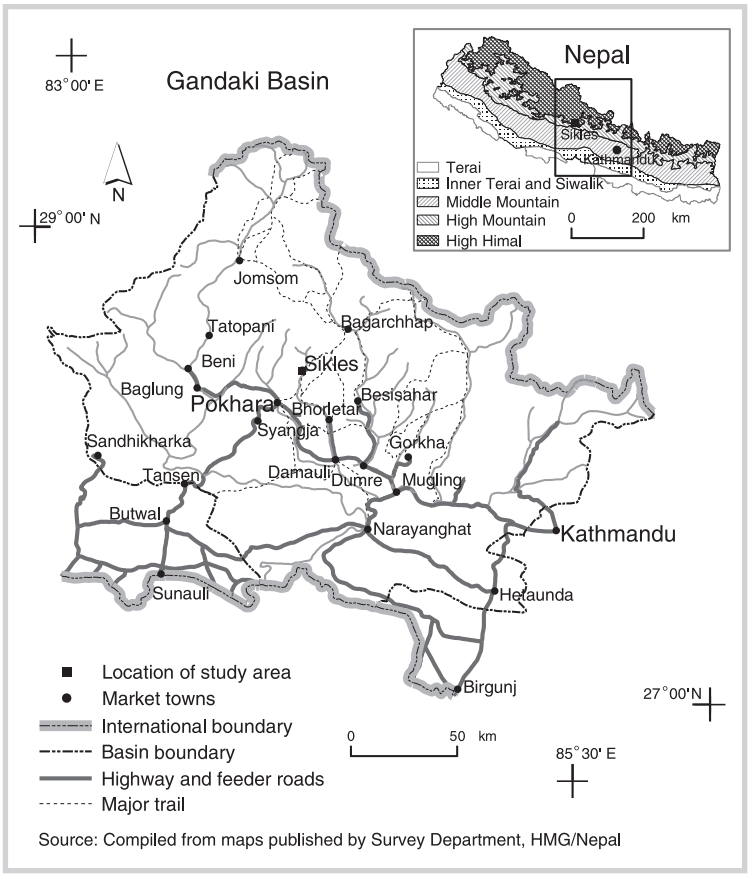
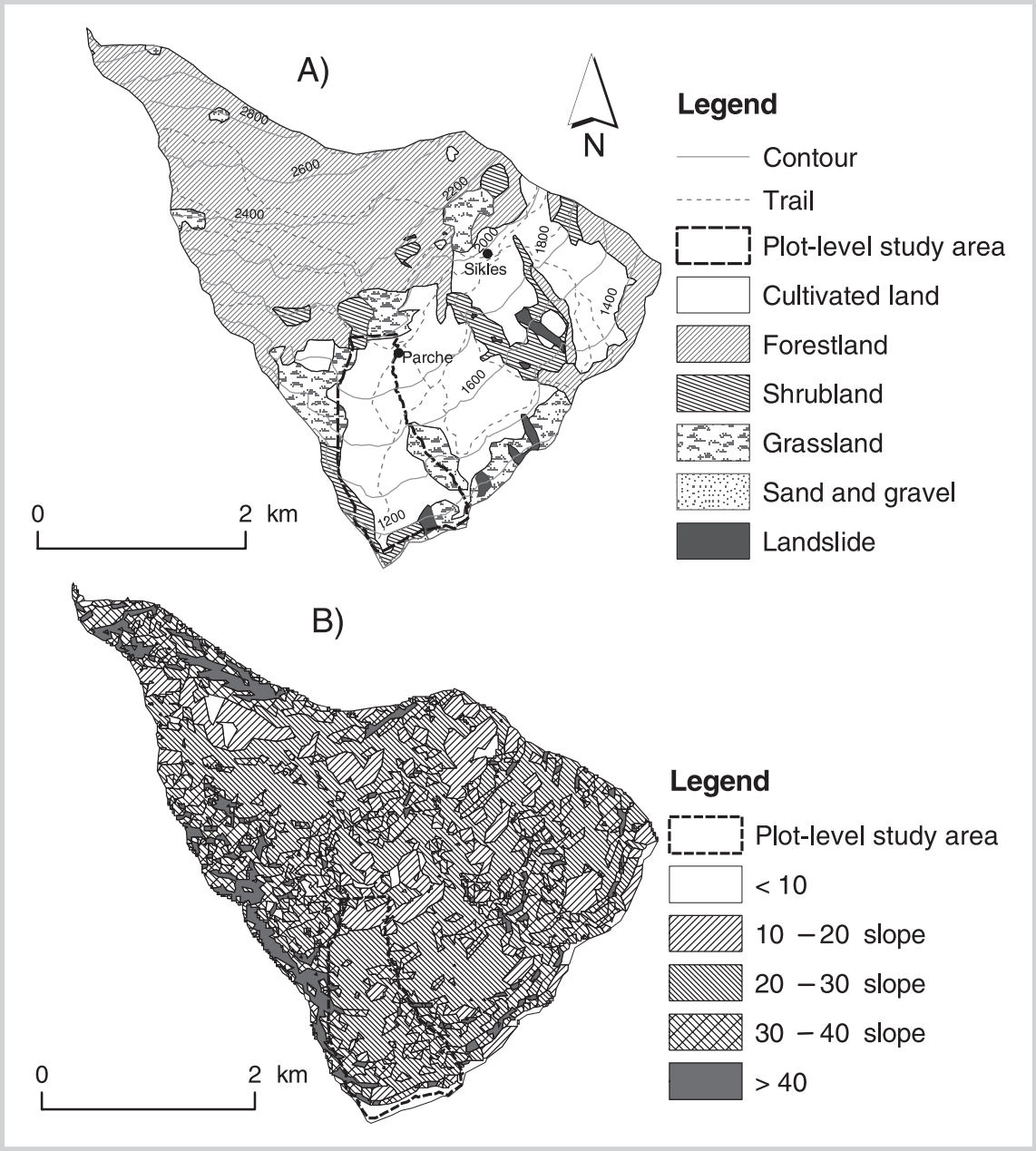


FIGURE 2 Location of study area. (Map by authors)

FIGURES 3A AND 3B Major land use and land cover types (A), and slope map (B) in the Sikles area. (Derived from Toposheet No 288409, prepared by the Survey Department, HMG/Nepal, based on aerial photograph in 1996 and field verification done in 1999)



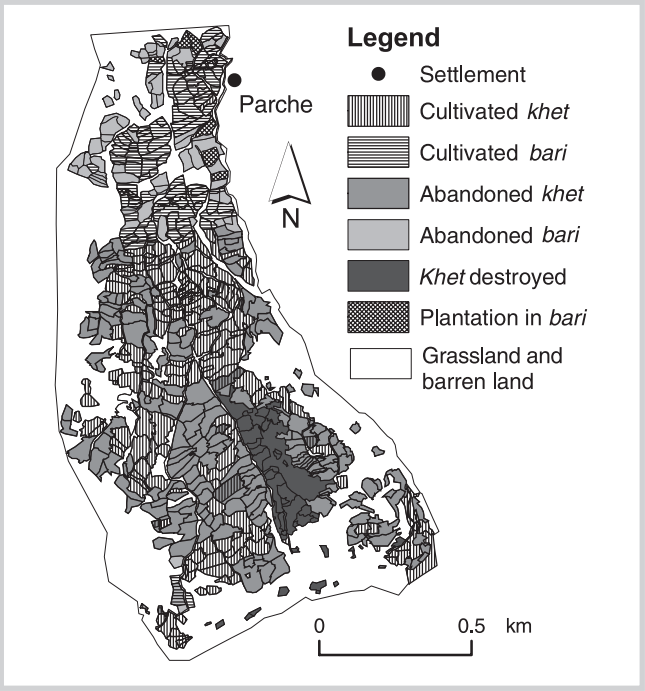
donment and geomorphic damage. Cadastral maps prepared between 1974 and 1979 at the scale of 1:2500 were obtained from the District Survey Office, Pokhara, Kaski. Abandoned plots observed during fieldwork (April–May 2004) were marked on the cadastral maps. All types of geomorphic damage observed in the field were mapped and their dimensions measured. An inventory sheet was prepared to record information such as the types and extent of geomorphic damage observed in the field. Local people were consulted to collect additional information about phenomena such as the first year of land abandonment and the reasons for abandoning land use. All the maps were digitized and the necessary information was derived.

Results and discussion

Abandonment of agricultural land: context and trends

The household survey (1999/2000) revealed that cultivated land in the study area ranges from only 0.01 ha to 1.43 ha in area, with an average of 1.28 ha. The distribution of land among farm households is very uneven. More than 28% are marginal farm households with less than 0.5 ha. Small farm households with 0.5–2.0 ha con-

FIGURE 4 Abandoned agricultural land and other land use and land cover types. (Source: field survey, 2004)



stitute about 56% of the total households surveyed. Only 15% of households have medium-size and large farms with more than 2 ha of land. Agricultural land is also highly fragmented. The number of plots among farm households ranges from 1 to 41, with an average of 10 plots. The average walking distance between the house and the farm is about 31 minutes.

Of a total of 149.6 ha of land selected for plot-level study, 63.2 ha comprised grassland and barren public land, including trails and canals (Figure 4). The remaining 86.4 ha were privately owned cultivated land. There are 2 types of privately owned cultivated land, *khet* and *bari*. *Khet* consists of level terraces on which wet paddy is grown; it is irrigated during the monsoon season by local springs and harvested water from gullies, open slopes, and terraces. *Bari* consists of non-irrigated rainfed terraces where maize, dry paddy, millet, wheat, and barley are grown. A large proportion of the cultivated land in this area is *khet*. Currently, 40.6% of all *khet* and 57.6% of all *bari* are under cultivation (Table 1). Abandoned cultivated land comprises about 49.4% of all *khet* and 37.1% of all *bari*. Nearly 10% of *khet* has been damaged by floods and landslides. Plot-level surveys showed a higher proportion of abandoned land than the figures obtained from the household survey. The household survey showed that 22% of all cultivated land, 21% of all *khet*, and 27% of all *bari* were abandoned. This was mainly due to the fact that the household survey did not cover households that had permanently outmigrated, had retained ownership of land, but had abandoned it. A large part of the area selected for the plot-level study was far from the settlement, which is located 2–4 km away and is 500–700 m lower. This could be another reason for such a higher proportion of abandoned land in this area. However, both surveys showed significant amounts of abandoned land.

Abandonment of agricultural land with ownership rights intact is a recent phenomenon, though abandonment of whole settlements and nearby agricultural land due to natural and anthropogenic hazards—such as epidemics, heavy snowfall, degradation of natural resources, and armed conflicts—was common in the past (Kawakita 1957; Messerschmidt 1976; Mahat et al 1987; Hagen 1998; Khanal 2002). Abandonment of agricultural land after centuries of use began in this area after 1980, at an increasing pace. Nearly 1.4% of all cultivated land was abandoned between 1980 and 1984. This increased to 12.1% in 1989, 27.6% in 1994, 42.6% in 1999, and 46.6% in 2004. Though the pace of abandonment of agricultural land slowed after 2000, it is still high (approximately 1% of the total cultivated area in one year). More importantly, the high cumulative percentage of abandonment remains unchanged.

Drivers of land abandonment

A combination of several forces and factors has been involved in this increasing trend towards abandonment

TABLE 1 Land use and land cover types at plot level in the study area. (Source: field survey, 2004)

	Khet		*Bari*		Total	
Land use / land cover type	**Area (ha)**	**%**	**Area (ha)**	**%**	**Area (ha)**	**%**
Cultivated land	27	40.6	11.5	57.6	38.5	44.5
Plantation	—	—	1.1	5.3	1.1	1.2
Abandoned	32.8	49.4	7.4	37.1	40.3	46.6
Destroyed by flood/landslide	6.7	10.0	—	—	6.7	7.7
Total	**66.5**	**100**	**20**	**100**	**86.4**	**100**

TABLE 2 Number of economically active and inactive persons in Sikles and Parche. (Source: household survey, 1999/2000)

Number of persons	Present	Absent	Total	Absent (%)	Absent, abroad (%)
Economically active (15–59 years)	**210**	**86**	**296**	**29.1**	**23.0**
Male	83	78	161	48.4	37.3
Female	127	8	135	5.9	5.9
Economically inactive (< 15 and > 59 years)	**235**	**19**	**254**	**7.5**	**1.6**
Male	118	10	128	7.8	2.3
Female	117	9	126	7.1	0.8
Overall total	**445**	**105**	**550**	**19.1**	**13.1**

of agricultural land in recent years. Tremendous changes have taken place in the spatial context, population structure, and livelihood strategies, with improvement in accessibility, the penetration of the market economy, and the consequent growth of market towns and urban centers and the opening of the country to the international job market, particularly after the 1970s.

Improved access, outmigration, and increasing shortage of labor

Access to other areas was significantly improved after the construction of the Sidhartha Highway linking Pokhara to Sunauli (1964–1972), the Prithivi Highway linking Pokhara to Kathmandu (1967–1972), and the Narayanghat–Mugling Highway (1972–1982) (Figure 2). This made it possible to import essential goods—including food grain—at a cheaper price from the Terai plains of Nepal and India. Moreover, increasing urban services and amenities such as education and health, and investment opportunities in Pokhara, attracted many families to migrate permanently from the study area.

About 255 families outmigrated permanently from these 2 settlements after the 1960s, which amounts to more than half of all families in the 2 villages of Sikles and Parche. Pokhara was the destination of more than 213 families who outmigrated from these settlements. Population data compiled by the government also show a net decline in the total population of the Parche Village Development Committee (VDC) during the 47-year period between 1954 and 2001: from 3127 to 2940 inhabitants. Moreover, the proportion of the temporarily absent population has increased tremendously.

Since the beginning of the 19th century, short-term emigration in search of jobs has been one of the strategies of people in Nepal—including those in the present study area—in order to minimize the risk of food shortage and rural indebtedness (Kansakar 1974; Khanal 2002). Many members of Gurung families were recruited for the British and Indian armies. However, employment opportunities at that time were limited to certain ethnic groups. The opening of employment opportunities in foreign countries, especially in Gulf countries after 1970, attracted many young people from this area. As a result, the proportion of the absentee population increased from 5.8% in 1954 to 19.1% in 1999/2000 (Khanal 2002). The proportion of the population absent owing to employment in foreign countries amounts to 13.1% (Table 2). More than 48% of the total economically active male population was away from the village. As a result, cash flow from remittances, pensions, and services has been increasing. This has enabled local people to purchase imported items. Therefore, people are not encouraged to grow traditional crops with a low rate of return.

School-age children between the ages of 5 and 14 comprise about 21% of the total population; 87% are enrolled in school. In the past these children would have been used directly or indirectly as a part of the laborforce in agricultural activities. Such an increasing trend towards outmigration of the economically active population, and school attendance by children constituting a traditional source of labor, has resulted in a shortage of labor available for agricultural activities.

Low performance of the agricultural sector and increasing need for cash income

The obvious reason for abandonment of cultivated land is the low rate of return from traditional crops. Labor, farmyard manure, and chemical fertilizers have significantly boosted productivity for many traditional crops grown in this area. However, the marginal physical productivity of labor for all crops is less than the wage rate in off-farm sectors such as urban services and construction (Khanal 2002). Small and highly fragmented landholdings on steep slopes have constrained the use of modern labor-saving agricultural implements, developed primarily for plains areas. Owing to the marginal productivity of labor on the one hand, and the growing need for cash income to cover the cost of education

and modern medical services on the other, people are more interested in searching for lucrative employment opportunities elsewhere. Farmyard manure is another important input. Every year huge amounts of farmyard manure are used to maintain the productivity of the soil. Animals are grazed and kept at night in cultivated fields for a few days. Almost all cultivated fields are manured by shifting *goth* (temporary sheds for animals) from one place to another. However, the supply of farmyard manure has also declined as a result of the decline in livestock population. Livestock population has been declining by about 1.6% per year during the 50-year period between 1950 and 2000 (Khanal 2002). Such a decline in the supply of farmyard manure has adversely affected the productivity of traditional agricultural crops.

While chemical fertilizer increases productivity, the benefits are marginal in light of current market prices. There are further limitations to the benefit of using chemical fertilizers, including uncertainty about their availability and adverse effects on soils on cultivated terraces. All these factors discourage farmers from continuing traditional crop cultivation.

Government policies

Government policies on ownership and land use rights, taxation, and rent also have a direct and an indirect bearing on the growing rate of land abandonment. Land rent at present is very high (50% of total production). This high rate has discouraged tenant families from renting additional land for cultivation. Amendment of the Land Reform Act of 1964 in 1997 envisaged elimination of dual land ownership by providing that land be equally divided between owner and tenant. This legal provision, however, has discouraged landowners from renting out their land to other people. If a landowner rents out his land to a tenant, the tenant could claim 50% of the land that he has rented. Hence, owners are not willing to rent out their land. At the same time, the land tax is currently negligible, so that absentee households are encouraged to keep ownership rights by paying a land tax without cultivating the land in their place of origin. No clear policies for the control and management of abandoned land have yet been developed and implemented by the government.

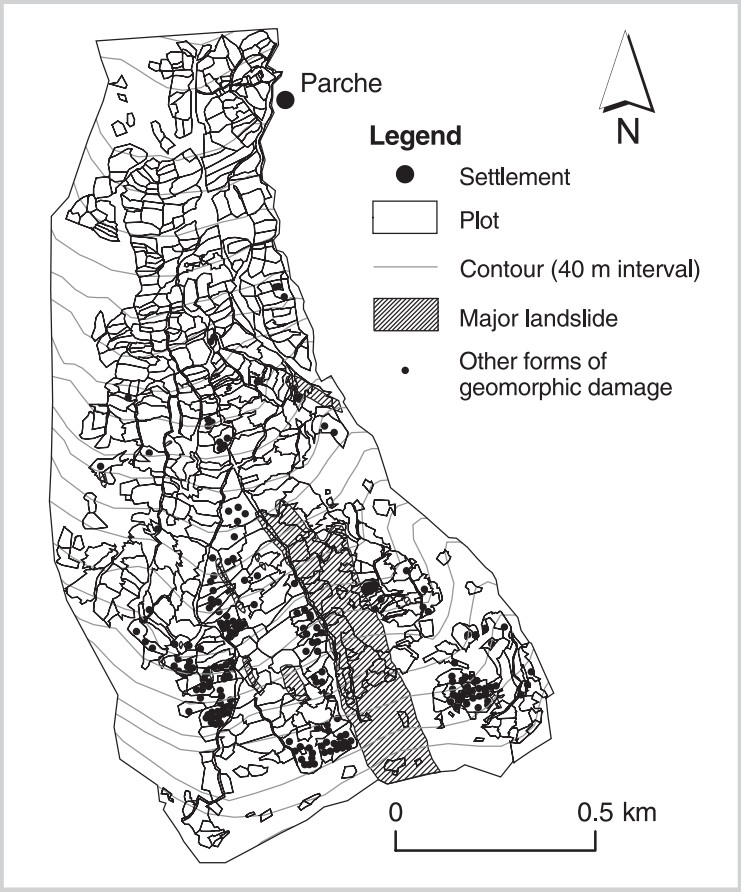
Consequences

A large proportion of agricultural land has been left idle. Obvious economic consequences are the decline in the level of agricultural production, a consequent decline in farm income, more food shortages, and dependency on the external economy. As mentioned above, more than 49% of *khet* and 37% of *bari* have been abandoned, while the production of paddy has declined by more than 49% and that of maize and millet by more than 37% in this area.

Increasing abandonment of cultivated land has not only caused a decline in the level of agricultural production in the villages but also seriously affected the livelihoods of marginal and small farm households in the villages. In the past, the livelihoods of many low-income households were mainly based on village agriculture. Since there were limited investment opportunities in sectors other than agriculture, outside income such as remittances and pensions was used to enhance agricultural activities, including land maintenance by hired hands. Such employment opportunities for low-income households have been disappearing from the villages due to increasing land abandonment. These low-income households are forced either to outmigrate from the villages in search of a job or to depend on marginal public land for their livelihood. However, many marginal and small farm households have no opportunity to find lucrative jobs outside the villages, since getting such jobs requires quite a high initial degree of investment in terms of preparation and transportation. At the same time, these farm households are discouraged from using abandoned land, partly because of high land rent and partly because of the unwillingness of absentee landlords to transfer the right of land ownership at lower prices or rent out their land to other people living in the villages. This has led to increased food shortages and poverty among marginal and small farm households in the villages.

Hillslopes up to 40° have been utilized for agriculture (Figure 3B). People have adopted different measures to control runoff and minimize soil loss and instability on hillslopes and in gullies. Commonly adopted structural measures are the construction of terraces and raisers, waterways, stone pavement of trails, retention walls, and check dams. Besides biological measures such as alley cropping, mulching and tree plantation are also commonly used. Terrace risers, their beds, and waterways are repaired regularly before sowing/transplanting of crops and during weeding. Every year farm households spend a great deal of labor for the maintenance of terraces and the control of gullies, landslides, and floods on cultivated fields. In the past, agricultural activities were practiced at community level in this area, with local rules and regulations regarding the use and management of farmland, including pasture and forests. There was strong social cohesion and it was feasible to use the available laborforce in the village for the maintenance of terraces and irrigation canals, as well as the control of gullies, landslides, and floods—even on farms owned by individual households—through community-guided management systems, without paying cash for labor services.

FIGURE 5 Spatial distribution of geomorphic damage. Note that geomorphic damage is observed on abandoned agricultural land. (Source: field survey, 2004)



In the absence of regular maintenance, abandoned fields have been subjected to a variety of types of geomorphic damage. The damage process is further intensified by animal trampling, since abandoned fields are open to grazing. Roughness of terrace beds increases, due to accumulation of materials removed from terrace risers and to trampling. This ultimately leads to modified paths of both overland and subsurface flow. Concentrated flows along the furrows initiate various forms of geomorphic damage such as rills, gullies, sheet wash, and landslides.

These types of damage were mapped and measured in the field. Out of a total of 640 agricultural plots in the study sites, 43% were abandoned and another 7% previously used for agriculture were completely damaged due to landslides on the hillslope, particularly along gullies and floods in the valley along Madi Khola (Figure 5). Nearly 41% of all abandoned plots (excluding completely damaged ones) were subjected to such geomorphic processes.

The number of abandoned plots (excluding the plots completely damaged due to landslides and floods) subjected to different types of geomorphic damage is given in Table 3. Damage to terrace risers was observed in about 35% of all abandoned plots, followed by: cracks, rills, gullies; sheet wash, scars; and landslides or landslips. The proportion of plots subjected to different types of geomorphic damage is very high on *khet* compared to *bari* (Table 3). *Khet* consists mostly of inward-sloping terraces with high terrace risers, located near natural springs.

The average amount of damage on plots abandoned earlier is greater than that on plots recently abandoned (Figure 6). Worse geomorphological conditions found on fields abandoned earlier than on those abandoned more recently agrees with findings in the southern Pyrenees (Ruiz-Flano et al 1992). Though geomorphic damage on cultivated terraces occurs frequently, it is mostly minor enough to be repaired annually by farming households. Therefore the contribution to total soil loss from the catchment seems to be small. Gerrard and Gardner (2002) estimated a comparatively smaller amount of soil loss from *khet* (0.48 t/ha/y) than from forest (0.80 t/ha/y) and grassland (1.86 t/ha/y) in the Likhu Khola drainage basin, in the Middle Hills of Nepal, between 1991 and 1993. They also found a very high rate of soil

TABLE 3 Types of geomorphic damage on abandoned cultivated plots. (Source: field survey, 2004)

	Khet		*Bari*		Total	
Type of damage	**Number**	**%**	**Number**	**%**	**Number**	**%**
Damage to terrace riser	74	34.9	—	—	74	26.8
Crack/rill/gully	23	10.8	5	7.8	28	10.1
Sheet wash/scar	14	6.6	—	—	14	5.1
Landslide/slip	57	26.9	—	—	57	7.7
Undamaged plots	*44*	*20.8*	*59*	*92.2*	*103*	*37.3*

loss from scrub and abandoned land (23.95 t/ha/y) as compared to soil loss on cultivated *bari* (3.65 t/ha/y). *Khet* plays an important role in runoff generation, erosion, and downstream flooding. Well-maintained *khet* acts as a reservoir and detains water and hence overland flow (Wu and Thornes 1995, cited in Ives 2004). The checking effect of *khet* on water and sediment reduces the risk of downstream flooding.

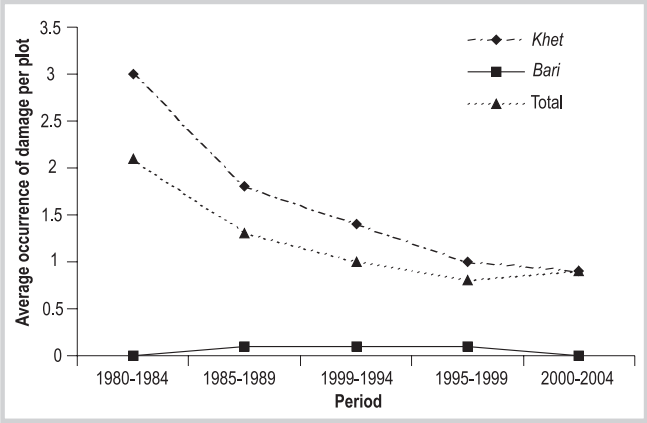
It is evident that farmland abandonment does not automatically lead to plant colonization, since geomorphic damage takes place prior to colonization. Prior to abandonment, fields are intensively used for crop production; thus, the productivity of the soil is reduced due to overexploitation of soil nutrients. Moreover, once cultivated land is abandoned, it is commonly used for animal grazing as public land, though legally it is private land. Plant colonization thus takes too long after abandonment to be protective. In the absence of plant colonization, geomorphic damage is intensified due to increased overland flow. Such processes of land degradation after abandonment are not unique in this area: they are also common in other mountain areas of the world (Francis 1986; Vogel 1988; Lasanta et al 1995; Harden 1996).

It is clear from the above discussion that careful land management is necessary even after abandonment to minimize adverse geomorphic and ecological consequences. Such land management could include re-utilization of abandoned land to improve livelihoods of farm households. However, as labor-intensive traditional crops are not attractive from an economic point of view, other uses should be considered. Experience in other mountain areas within the Hindu Kush–Himalaya region shows that opportunities exist to develop market-oriented niches based on farming, eg diversification of fruit farming and agroforestry on marginal and sloping farmland (Partap 1999). Ownership and land use rights are constraints when trying to introduce such modified farming systems. Most abandoned land is currently owned by absentee families who are not willing to transfer ownership and rights of use because of the very low land tax.

Conclusions

Abandonment of cultivated land has been increasing in the Nepal Himalaya, as shown in the Sikles area, which is quite accessible from Pokhara, one of the rapidly growing market towns in the country. Major changes in the spatial context, population structure, livelihood strategies with improved accessibility, the penetration of the market economy, the consequent growth of market towns and urban centers, and the opening of the country to the international job market, particularly after the 1970s, have been the major drivers of the increasing

FIGURE 6 Frequency of geomorphic damage according to duration of abandonment.



trend towards land abandonment. In addition to this, government policies regulating ownership and rights of use, taxation, and rent also have a direct and an indirect bearing on abandonment.

Increasing food shortage and declining livelihood options, particularly among marginal and small farm households, are some of the socioeconomic consequences of abandonment of agricultural land. Abandoned cultivated fields once intensively utilized and managed through massive inputs of labor and farmyard manure are being subjected to different types of geomorphic damage. This has increased the risk of mountain hazards such as floods and landslides. Simple farmland abandonment is not sufficient to induce plant colonization in the areas where open animal grazing is common and soils are poor.

Such areas require effective management in order to reduce environmental risks and improve the livelihoods of farm households. There are opportunities to develop market-oriented niches based on farming systems, such as commercial dairy farming at lower altitudes with substantial increase of fodder trees, off-season vegetable farming, fruit farming, tea cultivation, agroforestry, etc on such abandoned land. In view of the highly fragmented nature of landholdings, it is necessary to develop activities at group/community level, so that economies of scale can be achieved and local people can benefit. However, effective land use policies, including amendment of existing ownership, rights of use, and taxation are necessary. A strong technical support system is also necessary for sustainable development of niches based on farming.

Abandonment of agricultural land observed in the Nepal Himalaya is not unique: it is common in many mountain areas in the world. However, this has recently resulted in pronounced socioeconomic and environmental problems in Nepal.

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