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Forest, agriculture, and migration: contemplating the future of forestry and agriculture in the middle-hills of Nepal

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ABSTRACT

Nepal has experienced rapid transitions in forest and agricultural practices over the last several decades. This study compares surveys of forest cover, land use, demographic and socioeconomic characteristics of six sites in Sindhu Kabhre and Palanchok Districts conducted in 1992 and 2017. We correlated these transformations with changes in forest cover as documented with remotely sensed images. We found that forest cover has increased tremendously; farmers are less reliant on forests and forest products, and occupational multiplicity, where households create a nexus of activities, some on farm and others elsewhere, may offer a stable situation for the future of these villages.

KEYWORDS

Forest regeneration; agrarian change; migration; Nepal; longitudinal study; remote sensing

Introduction

In the 1970s, Erick Eckholm described Nepal in terms of a vicious circle of environmental crisis and population disaster (Eckholm 1976). In 1979, a Word Bank report declared that Nepal had lost half its forest cover between 1951 and 1980 and that by 2000 no accessible forests would remain (World Bank 1979). In response, the Government of Nepal (GON) carried out its first national forest mapping exercise in 1979 showing that 38% of the country was forested (LRMP 1986). A second national forest survey conducted 15 years later in 1994 showed that only 29% of the country was still forested (DoFRS 1999). Clearly, Nepal was facing a serious loss of forest cover. A number of mapping projects performed since then, however, have documented a resurgence of tree cover across the country (Hansen et al. 2013; Uddin et al. 2015; GON 2015), with the latest study showing 40% of the country forested in 2010/11 (GON 2015). Hence, Nepal began the forest transition out of tree-cover loss into tree-cover gain sometime in the early 1990s (Paudel et al. 2016; Gautam, Shivakoti, and Webb 2004).

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Mather (1992) proposed the term 'forest transition' to describe a trajectory of change where initial forest loss is followed by recovery as a country undergoes social and economic changes. Rudel et al. (2005) proposed two forest transition pathways. The first is an economic pathway associated with industrialization and the growth of a service economy. Economic development pulls labor away from rural areas and accelerates depopulation and agricultural decline in the areas least suitable for farming. The second pathway is a forest scarcity pathway associated with deforestation caused by agricultural expansion or wood extraction. The increasing demand for wood products caused by deforestation induces landowners and governments to plant and manage trees more intensively.

Recent empirical studies suggested that these two pathways are insufficient to explain contemporary forest transitions. Meyfroidt and Lambin (2011) identified three additional pathways of forest transition: globalization; state forest policy; and smallholder, tree-based land use intensification pathways. The globalization pathway is a modern version of the economic development pathway in which global markets and ideologies (as opposed to domestic markets and industrialization) increasingly influence national economies. The state-forest policy pathway is similar to the forest scarcity pathway but emphasizes the role national forest policies such as social and community forestry programs play in stirring the transition. In the smallholder pathway, a significant increase in tree cover is associated with the expansion of smallholder fruit orchards, woodlots, agroforestry systems, gardens, hedgerows, and secondary successions on abandoned lands that farmers may enrich with valuable species (Hecht 2010).

Nepal provides a useful case study for exploring forest transition relationships because farmers in Nepal were historically dependent on a complex interaction of farm and forest resources, and hence most Nepali villages are a mosaic of agricultural and forest patches. Nepal has gained worldwide recognition for path-breaking achievements in community forest management. Numerous studies have examined the role of communities in forest management in Nepal at village scales (e.g. Agrawal and Gibson 1999; Agrawal and Ostrom 2001; Birch et al. 2014; Chakraborty 2001; Gautam, Shivakoti, and Webb 2004; Joshi et al. 2013; Poudel, Fuwa, and Otsuka 2013). A comprehensive study of 30-years of community forestry (MFSC 2013) found that Nepal's community forestry program had resulted in significant improvement in forest cover.

This paper seeks to summarize differences between a 1992 survey of six study sites and a survey conducted in the same six sites in 2017, and to place these differences into the context of the decoupled agrarian questions of labor described by Bernstein (1994), Blaikie et al. (1980, 2002), and Rigg (2006); to summarize differences in tree cover in the six VDCs between 1995 and 2015 in order to correlate changes observed in the 1992 and 2017 surveys with changes in mapped tree cover, and to place these changes into the context of the forest transitions described by Meyfroidt and Lambin (2011) and Hecht (2010); and finally to summarize differences between households with and without migrants in the 2017 survey, to seek insights into how land use is changing in response to migration and to evaluate the implications of these changes for the future of trees and agriculture in the six sites, and to place these into the context of the 'ecological agrarian questions' raised by Akram-Lodhi and Kay (2010).

Background and theorical framework

While small, Nepal is a complex country that ranges from sea level to the top of Mount Everest. The country is inhabited by almost 30 million people. The population belongs to 125 different ethnic groups with 92 living languages (although most people speak Nepali) (Central Bureau of Statistics 2012). The numerous ethnic groups can be considered as belonging to three types. Hindu groups such as Brahmin, Chettri, and Damai that migrated from the south and west and speak Indo-Aryan based languages. These groups account for approximately 65% of the population. *Janjati* groups (non-Hindus with their own mother tongue and traditional cultures) make up the remaining 35% of the population. The *Janjati* can be further divided into two groups; those who belong to Tibeto-Burman language groups that migrated from the north and east, such as the Sherpa, Gurung, and Tamang. They make up approximately 28% of the population. The second *Janjati* group are the *Adivasi,* considered to be the indigenous people of Nepal. They comprise about 7% of the population (Messerschmidt and Hofer 1981).

The country is usually described as consisting of three distinct physiographic zones, the Mountains, Middle Hills, and Tarai (lowland plains). The Middle Hills lie between 700 and 4000 meters above sea level (asl) and include approximately 45% of the country's total population, 35% of its land area, and 58% of its forest cover (DoFSC 2019).

Gritten, Sikor, and Atkinson (2013) summarized community forestry programs in Asia in terms of three characteristics. First, community forestry has become an important pillar of forest policy in the region. Communities possess statutory tenure rights to 34% of the region's forest land by virtue of various tenure arrangements, ranging from village-based groups to household management. Second, community forestry has not progressed evenly across the region. Some countries in the region have progressed further than others in terms of tenure transfers to communities and legal recognition of their active control over forest management. Nepal stands out for its forest user groups, under which communities hold strong tenure rights and exercise active control.

Nepal is also highly involved in the global labor market. Current figures suggest that approximately one-third of the working male population, four million migrants, work outside of Nepal, and foreign remittances constitute a quarter of the income of all households (Bhawana and Race 2020; Adhikari and Hobley 2015). Other researchers, (e.g. Fox 2018; Bhawana, Wang, and Gentle 2017; Jaquet et al. 2016; Khanal et al. 2015) have found that the impact of a resilient community forestry program and the globalization of labor have resulted in an improvement in forest cover and in some cases, the abandonment of agriculture land.

Hence, in Nepal, we are not only witnessing a forest transition, but also an agrarian transition. Farmers are beginning to diversify their sources of income to include income from non-farm sources and work elsewhere. Consequently, some farmers are abandoning marginal agricultural lands and tree cover is regenerating in uncultivated fields as well as formerly degraded forests. The forest transition in Nepal is real, yet, and an agrarian transition is real as well. While many farmers continue to practice subsistence agriculture, where markets exist, farmers are beginning to use land more intensely for higher value crops.

The agrarian question in political economy, long an important topic of inquiry, including in Nepal (Blaikie et al. 1980), does not constitute a single straightforward question. Akram-Lodhi and Kay (2010) provide a useful review of seven variants of the agrarian questions in scholarship. In this paper, we are interested in engaging with two of these. These are the third variant, 'the decoupling of labor from agrarian capital', and the seventh variant 'ecological agrarian questions'. The 'decoupled agrarian question of labor' was proposed by Bernstein (1994) who argues that the internationalization of capital has 'decoupled' capital from labor. In this view the globalization of capital has meant that the emergence of agrarian capital within a state is now irrelevant except in how it shapes political struggles by labor over resources, production and accumulation. By 'decoupling' labor from agriculture, Bernstein argues that globalization has created an agrarian question of labor while rendering the agrarian question of capital redundant.

Bernstein's (1994) decoupling of labor from agrarian capital hypothesis resonates with the work of Jonathan Rigg. Rigg (2006) argues that lives and livelihoods in the Rural South are becoming increasingly divorced from farming and, therefore, from the land. Rigg calls this process 'deagrarianization' and suggests it is characterized by (1) diversification of rural occupations and livelihoods; (2) occupational multiplicity becoming more common and more pronounced; (3) balance of household incomes shifting from farm to non-farm; (4) livelihoods and poverty becoming delinked from land (and from farming); (5) lives becoming more mobile and livelihoods correspondingly delocalized; (6) remittances playing a growing role in rural household incomes; (7) average age of farmers rising; and (8) cultural and social changes being implicated in livelihood modifications.

In their book, *Nepal in Crisis*, Piers Blaikie et al. (1980) argued that that the development of agrarian capitalism in Nepal was effectively precluded by Nepal's specific relationship with India, its own class structures, and the nature of the Nepali state (reinforced by foreign aid). Blaikie et al. (1980) saw Nepal's agrarian future as one of slow but inexorable economic decline, increasing poverty and the systematic failure of capitalist policies. However, when Blaikie, Cameron, and Seddon (2002) re-surveyed the same study area twenty-years later they concluded that their earlier work did not appreciate the household-level dynamics that gave rise to growth in off-farm and non-farm income from members of the rural household working away from home. They had failed to recognize that it is easier and less risky for farmers to prioritize food security and to release a member of the household to migrate and earn an income away from home, and even outside of Nepal altogether, than to enter the market as a producer. While labor from Nepal may still be competitive in international markets, it is difficult to identify markets for other commodities produced in Nepal that could bring in the same returns.

We are also interested in 'ecological agrarian questions', as Akram-Lodhi and Kay (2010, 270) suggest that agrarian changes are shaped by biophysical conditions. In Nepal, numerous authors (see Khanal and Watanabe 2006; Shrestha and Bhandari 2007; Tacoli 2009; Massey, Axinn, and Ghimire 2010; Gentle and Maraseni 2012; Bhawana and Race 2020) have found that approximately one-third of agricultural land in the middle hills has been abandoned because of decreasing land productivity, non-farm employment opportunities, social and political instability, and natural hazards. This has resulted in an increase in tree cover as trees and shrubs colonize abandoned agricultural land (Bhawana and Race 2020).

Finally, we are attentive to the ways that rural capitalism is highly contingent and context-specific (Akram-Lodhi and Kay 2010, 269). Thompson, Rigg, and Gillen (2019) argue that the modernization of farming in Southeast Asia is playing out differently from country to country as well as within countries, and differently than it did in America, Europe and Japan. We maintain that similar differences are playing out within Nepal and that scholars and policy makers need to be aware of these different development trajectories and seek to formulate development policies tailored to specific local conditions.

Study villages and methods

Australian assistance to Nepal in the forestry sector supported a series of projects conducted in Sindhu Palchok and Kabhre Palanchok Districts to the east and northeast of the Kathmandu Valley (Figure 1) between 1978 and 2006.[1] The projects attempted to improve forest management in the two districts through establishing forest plantations and assisting the development of community forestry. In 1992 and 1993, the first author, Collett et al. (1996), conducted a socioeconomic impact study for the Nepal-Australia Community Forestry Project (NACFP) (Collett et al. 1996). The study sought to understand the needs, problems, expectations, and aspiration of village households and to document the functioning of Community Forest User Groups (CFUGs) in the study sites. NACFP purposely selected the six sites to represent differences in biophysical, socioeconomic, and accessibility variables across the two districts, as well as the intensity of NACFP interventions.[2] Collett et al. (1996) and assistants administered a structured questionnaire to 30 randomly selected households in each of the six sites, conducted a participatory rural appraisal exercise, interviewed key informants and chronicled oral histories, and recorded the forest products collected by each household. The household questionnaire contained approximately 90 questions on demographic, income, agriculture and livestock, fuel, forest products, and forest management variables.

The Maoist Civil War, which began in 1996, made it difficult for the District Forest Officer and forest project staff members to continue to work in the study sites, and the project ceased its forestry extension and development work in the area by 2006. When the lead author visited the study sites during the insurgency, he noticed an absence of youths and middle age adults, namely men. Villagers told him that they fled in fear of the Maoists to work in foreign countries. He also noted that during the civil war villagers closed the sawmill in Chaubas village, the only successful CFUG operated mill in the country. After the insurgency ended, the mill opened and closed a few times. It is closed at the time of writing.

In 2017, Collett et al. (1996) returned to the same six sites with master's degree students from Tribhuvan University. They administered a similar questionnaire to 244 randomly selected households in the six sites. If available they interviewed the head of household,

[1]Australian support in relation to the forestry sector in Nepal began in 1962. Nepal received 'Australian foresters in Advisory roles' until 1978. But from thereon, Australian support was focused primarily on promoting community forestry works in two districts i.e., Kabhre Palanchok and Sindhu Palchok (see Griffin 1988). Four successive projects operated from 1978 in these two districts until 2006.

[2]Two of the original sites contained households belonging to different Village Development Committees (VDCs)—the smallest administrative unit in Nepal prior to 2017 (see Collett et al. 1996, 5–8 for details) while other sites covered only one VDC. The maps were made according to the main VDC in which most of the interviews were conducted. We will use the terms study sites and VDCs accordingly.

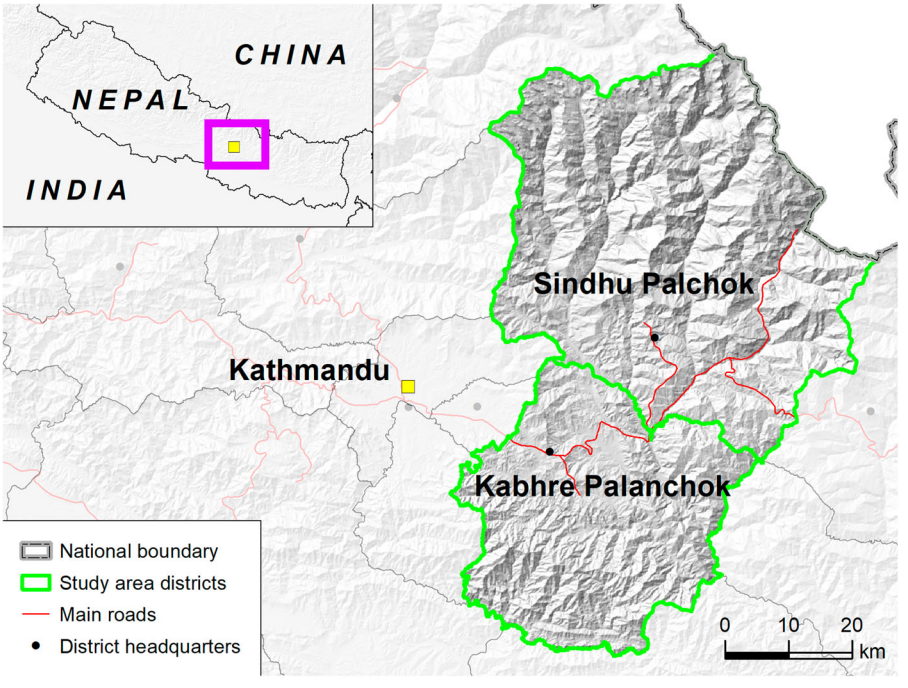

Figure 1. Projects conducted in Sindhu Palchok and Kabhre Palanchok Districts to the east and north-east of the Kathmandu Valley.

but if not, they interviewed a responsible adult member of the household. The total number of households in each site ranged between 38 and 43. They also collected information on each individual registered as belonging to that household (whether they were absent or present). They recorded information on the 1409 individuals registered to the 244 households. In this longitudinal study we assessed changes in land use practices for the household level variables documented in the 1992/93 survey in the context of the socio-ecological landscape in 2017. We also seek to examine differences in livelihoods and land-use practices among households with and without migrants in the six sites in 2017. In Kabhre Palanchok, the three sites were Sarsyu Kharka-Saramthali, Chaubas, and Nala Rabiopi; and in Sindhu Palchok, they were Pipal Danda, Hagam and Kyul.

Results

Objective 1: changes from 1992 to 2017

Roads

Since 1992, roads have reached all the study sites causing many changes in village livelihoods. Whereas, in 1992 visiting these villages required a long drive and up to eight hours of hiking, today a driver from Kathmandu could reach any of the villages within two to six hours. Nowadays community residents buy clothes, utensils, phones, electronic gadgets, etc. for themselves – as well as rice, tea leaves, sugar, lentils, and vegetables on a regular basis from the shops that have sprung up near newly constructed roads. Axinn, Barber, and Biddlecom (2010) describe this as 'a shift from direct to indirect consumption of

environmental resources.' While farmers are growing food crops for household consumption, cultivation of high-value cash crops for the market are becoming increasingly prevalent among farmers in these villages because these villages are on the boundary of the Kathmandu Valley and its large markets. Hence, though farming was once a subsistence activity, it is now primarily a commercial pursuit centered on selling products to markets that have become accessible through the new road network.

Roads are often associated with deforestation and environmental degradation particularly in tropical frontier forests (Angelsen and Kaimowitz 1999; Geist and Lambin 2002; Rudel et al. 2009). During the 1990s, the first author remembers people worried that roads would make it easier to transport logs, while others were concerned about the felling of trees for the roadway. However, once the roads were completed, vehicles brought supplies: rice, lentils, sugar, as well as liquid petroleum (LP) gas for cooking. Road building in these VDCs did not promote deforestation but they did lead to changes in land use. Some people whose land was near the road sold their land to those who wanted to move down from higher elevations in the village to start small businesses, leaving more marginal uplands abandoned or uncultivated allowing for tree cover to regenerate. Land price along the roadside skyrocketed accordingly. In India, Kaczan (2020) found similar results. The building of new roads raised the relative productivity of labor in non-agricultural sectors, thereby reducing agricultural activity and that new roads also encouraged the substitution of locally collected fuelwood with other energy sources. Both of these actions resulted in increased tree cover.

Community forests

Nepal was an early leader in initiating innovative programs of forest management aimed at involving local communities (Agrawal and Gibson 1999; Agrawal and Ostrom 2001). Since 1976, the Nepali government has experimented with a variety of programs aimed at decentralizing forest management, beginning with Panchayat Forest and Panchayat Protected Forest models of forestry (i.e. village-council based) and moving towards community forestry, leasehold forestry, and parks-and-people programs (Gautam, Shivakoti, and Webb 2004). In 1993, the government of Nepal promulgated the Forest Act authorizing the establishment of Community Forest User Groups to work with authorities from District Forest Offices (DFO) to develop management plans for protecting and utilizing forest lands.

Although internationally funded community forest programs had their advent in 1976, community forestry has a long history in Nepal. The British explorer Francis Hamilton noted in 1819 that 'in Nepal the pasture and forests are in general common, and any person that pleases may use them' (Hamilton 1819). Under the Rana regime (1846–1951) forest watchers or *chitadars* were appointed in the hills and were paid in kind by the villagers of all ethnicities (see Mahat, Griffin, and Shepherd 1986; Fisher 1989; Adhikari 1990; Bartlett and Malla 1992; Chettri and Pandey 1992; Tumbahampe 1994). The *kipat* systems of communal tenure were practiced extensively in eastern Nepal and amongst many Tibeto-Burman ethnic groups in central Nepal. Under *kipat* local people were allowed to collect forest products and village headmen (*jimmawals*) were recognized as the tax collectors and de facto owners of forest lands (Loughhead, Shrestha, and D 1994). The relatively recent history of common property management of forests in

Nepal has been overlooked in much of the literature as a precursor for the establishment of successful CFUGs.

Cronin (1979) in a study of the Arun Valley in the Middle Hills of eastern Nepal noted that 'everyone in the village shared the right to use the forest as needed, but nobody was allowed to clear the land.' In a village study conducted in 1980, Fox (1984) noted that while non-agricultural lands in the village were technically state property, villagers perceived them to be: government owned (*sarkari*); privately owned (*vyatigat*); local government owned (*panchayat* – later renamed as VDCs); and land devoted to the upkeep of a temple (*guthi)*. Despite differences in how villagers perceived forest ownership, in reality they were all used as open-access resources, but no one was allowed to convert them to agricultural uses. These lands were not 'deforested', i.e. converted to other uses, they were 'degraded'. While villagers 'degraded' forest lands through cutting poles, lopping tree leaves to the stem, cutting trucks down to their stumps, and over grazing, the fact that no one was allowed to convert them to private uses meant that they remained common property – land that could be used by anyone but nobody was allowed to turn them into private property.

After the government of Nepal promulgated the Forest Act in 1993, villagers almost immediately began to establish informal CFUGs that banned free grazing of livestock in the forests and limited the collection of firewood and timber to a few set days per year. Many villages began to institute common property management of forests lands as soon as the government legalized tenure rights and control of forest resources – even before the DFOs arrived to design and implement official plans (Fox 1984).

Kabhre Palanchok and Sindhu Palchok districts were among the first to apply for and receive community forest lands in 1988 and 1989, respectively. In addition to the nationally sponsored community forest program, NACFP promoted establishing tree plantations, and planting tree seedlings in degraded forests, private lands, and public land – with or without standing tree cover. The Australian forestry project, through the concerned DFOs paid for all costs, including monetary as well as local labor involved in procuring seeds, and growing and guarding seedlings until the plantations became established. In 2019, the DOF reports that there were 572 CFUGs in Kabhre Palanchok and 522 in Sindhu Palchok (DoFSC 2019). The most rapid expansion of CFUGs occurred in the mid-1990s, while today only a few new CFUGs are established annually.

Population

In 1992 the population of Nepal was 19.77 million people, and this increased by 47% to 28.98 million in 2016 (World Bank 2019). However, in recent years there has been a decline in the percentage of Nepal's total population living in the Middle Hills. In 1980, approximately 60% of the nation's population lived in the Middle Hills; by 2010, this figure had decreased to 45%. Nepal's national censuses for 2001 and 2011 show a total loss of 2244 people in the six VDCs documented in this study. This represents a loss of −0.72% per year, against a national gain of 1.3% per year (World Development Indicators 2019).

Among the households we interviewed in 1992 and 2017, we found that in 1992 only 11% of the people from these sites were living elsewhere. In 2017, 19% of the men and boys in these villages were either going to school or working elsewhere in Nepal or abroad, and 12% of village women and girls were absent, the vast majority living in

Kathmandu. Overall, one-third of household members were living outside of the village. In comparison with the national average, in the six study villages we found fewer young (0–19) and middle age people (20–39), and more elderly people (40–70+). The population of younger people has declined and there is a comparatively large population of older people. In terms of gender, there are fewer males than females in the 10–49 age brackets within the six villages, than in comparison with the nation.

Land

In 1992, an average household cultivated 25 ropani of land (1 ha = 20 ropani), owning 23 ropani and renting in another 2 ropani. In 2017, the average farmer cultivated 15 ropani, owned 16 ropani, shared out and rented in equal amounts of land, and fallowed 2.52 ropani. Hence, farmers today own only 70% of the amount of land they owned in 1992, cultivate only 54% of the land they managed in 1992, and fallow 16% of the land they owned. Farmers own less land today than in 1992 because when a head of household dies, the family customarily divides the land among male children. Presumably they are leaving land fallow because the returns to labor, now a scarce resource, are not sufficient to make it worth investing it in utilizing the land. The literature on Nepal (Bhawana and Race 2020; Jaquet et al. 2016; Khanal et al. 2015) refers to abandoned land, underutilized land, and fallow land. We did not ask farmers how long they had not used a piece of land they left empty and hence refer to unutilized land as fallow or uncultivated.

Livelihoods

In 1992, farmers reported their major occupation was farm work (52%), with the remaining non-farm including for example teaching and government posts (10%), students (15%), and small businesses (2%). In 2017, only 37% of respondents reported that farming was their major occupation; other major occupations included non-farm jobs (20%), being a student (31%), and owning small businesses (5%). Between 1992 and 2017, many farmers left farming as their major occupation and took up non-farm jobs or studying.

In the 2017 survey of the six study villages, farmers reported that the average household had an income of 130,479 Nepali rupees (NPR) annually (equivalent to $1135). An average farmer received 43% of their income from agricultural activities (crops, livestock, and wages from other agricultural activities), 48% of their income from non-farm activities (pensions, salaries, businesses, and other wages), and 9% from remittances. We found households with migrants made significantly more income from remittances than households without migrants. We also found that households with migrants had substantially more income (137,868 NPR) versus households without migrants (117,313 NPR). Khanal et al. (2015) found similar results; their study finds that households with migrants had an average income of 133,281 NPRs, compared to 108,815 NPRs for households without migrants.

We attribute the high value of agricultural activities in the six study villages to the fact that they are within easy access to markets in nearby district towns as well as Kathmandu. The first author observed that while few farmers continue to cultivate traditional food crops (e.g. rice, maize, etc.) for home consumption, they grow a variety of vegetables, fruits (e.g. kiwi, apples, lapsi), and other items (e.g. Bodhi-Chitta beads for making mala

[necklaces]), as well as livestock (e.g. chickens and goats) for nearby markets. In addition, today the Dairy Cooperation of Nepal runs nearby milk collections centers where farmers can sell milk daily.

Livestock and grazing

In 1992, most households owned large livestock (78% owned cattle, 68% owned buffalo), and 71% owned small livestock (goats and sheep). In 2017, fewer people owned large livestock (with 42% and 52% owning cattle and buffalo, respectively) and 82% owned goats and sheep. In 1992, the average household owned four cows and buffalos and 5.5 goats and sheep. In 2017, the average household owned 1.7 cows and buffalos and four goats and sheep. In 2017, fewer households were keeping large animals, and the number they kept was less than half the number they kept in 1992. The number of goats and sheep remained similar through time.

Forest products and cooking fuels

In 1992, community forests were new, and the survey did not ask farmers what products they collected. Ninety percent of households in 1992, however, reported that firewood was their main source of fuel. In 2017, 75% of households reported collecting products from their community forests. Farmers collected the following products (percent of households): fodder for livestock (65%), firewood (60%), grass for livestock (39%) and timber (2%). In 2017, farmers reported the following fuel sources: firewood (53%), fuelwood and liquid propane (LP) gas and/or biogas (39%), and LP gas (2%).

Objective 2: changes in tree cover 1995–2015

As part of the project on forest dynamics Van Den Hoek et al. (2021) mapped annual tree cover in Nepal over this period using topographically corrected and temporally harmonized annual Landsat image composites. Table 1 summarizes the mapped tree cover for the six VDCs at 5 points in time. Over the 20-year period, tree cover increased by dramatically in all six VDCs. Broken down by VDC, tree cover increased from a low of 26% in Hagam to a high of 194% in Saramthali. On average, tree cover grew at a rate of 2.10% per year. The transition from loss to gain of tree cover documented nationally by the studies

Table 1. Percent of VDC land area covered by trees between 1995 and 2015 and total percentage of land cover by trees 1995 and 2015.

	1995	2000	2005	2010	2015	Total increase in land covered by trees 1995–2015 (%)
Kabhre Palanchok:						
Saramthali	17	26	32	41	50	194
Chaubas	41	47	52	58	64	56
Nala Rabiopi	18	25	31	37	41	128
Sindhu Palchok:						
Pipal Danda	27	38	47	54	62	130
Hagam	62	66	70	74	78	26
Kyul	63	71	77	81	84	33

mentioned above had occurred here before 1995. Figure 2 shows tree cover in Saramthali between 1995 and 2015.

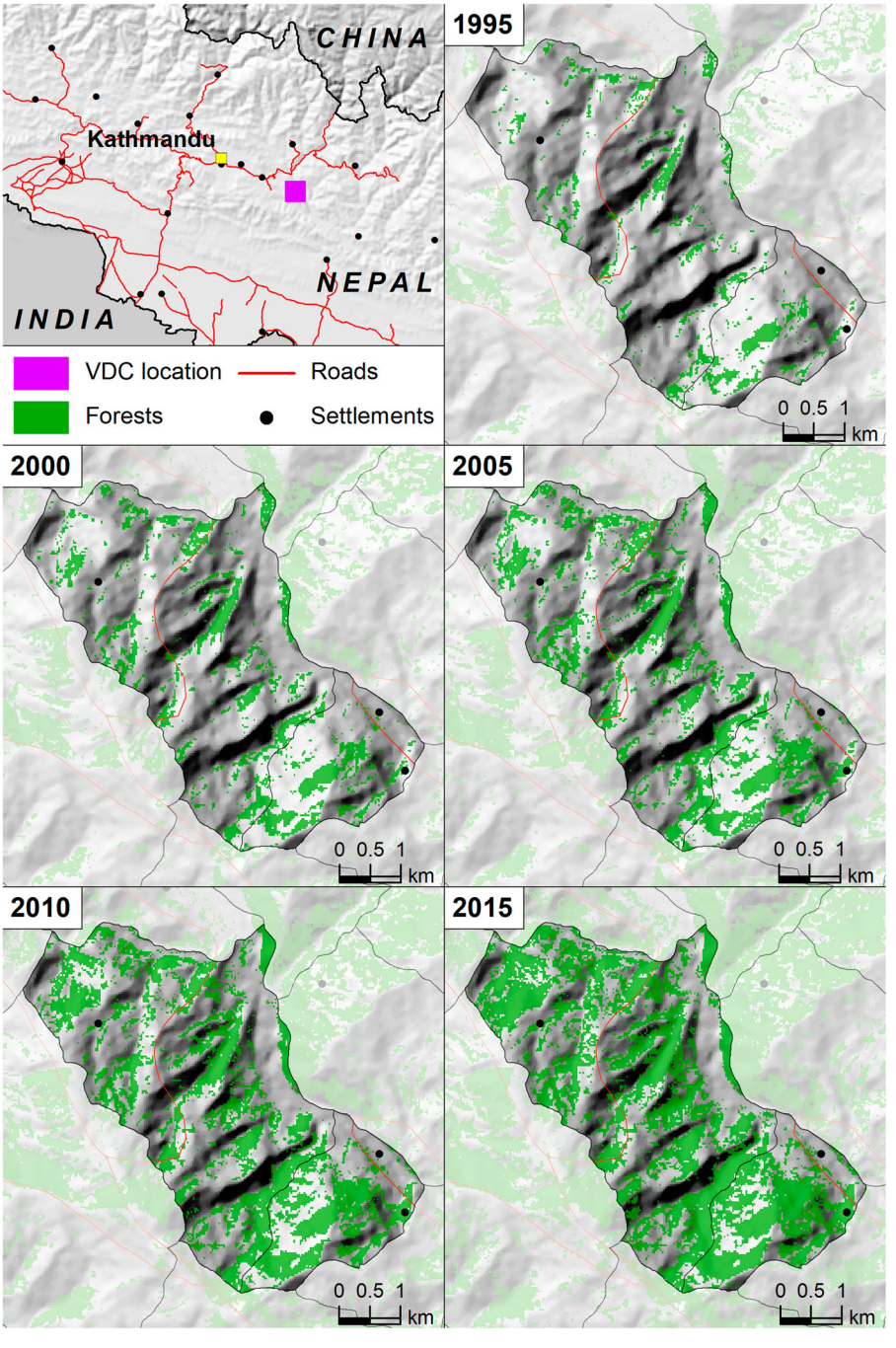

Figure 2. Map of tree cover expansion in Saramthali between 1995 and 2015. Source: Van Den Hoek et al. (2021).

The FAO Global Forest Resource Assessment (MacDicken et al. 2016) reports the three countries with the most rapid annual gain in tree cover between 2010 and 2015 were the Philippines (3.3%), Chile (1.8%), and Lao PDR (0.9%). Between 1995 and 2000, the average gain in tree cover for the six VDCs was 3.24% per year. By 2015, the rate had slowed to 1.84% per year, a rate still similar to countries with the most rapid gain in tree cover.

Objective 3: livelihoods and land-use practices among households with and without migrants in 2017

As observed in the previous section, migration (both temporary and long term) for work, education, and even retirement became a major phenomenon in these six sites over the twenty-five-year period. In this section, we summarize characteristics of households with and without migrating members. We do this at household level ($n = 244$) for household and land-use variables, and at the individual level ($n = 1409$) for demographic variables (Figure 3).

Household characteristics

In Table 2 we examine the characteristics of the 244 households in the survey; of these 157 (64%) households had migrant members and 87 (36%) did not have migrant members. Households with migrants have significantly more fodder and fruit trees and total trees than households without migrants. Households with migrants also burn more firewood from their own trees, and they keep more goats and sheep. They receive significantly more remittance income and have greater total income than households without a migrant. While the amount of land is small, they are also significantly more likely to leave irrigated rice land uncultivated. Other researchers (Bhawana and Race 2020; Jaquet et al. 2016; Ojha et al. 2017) have found similar results.

Households without migrants are significantly less likely to be involved in non-farm work, to have fewer trees, to burn less firewood from their own trees, and to keep fewer goats and sheep than households with migrants. They receive less income from

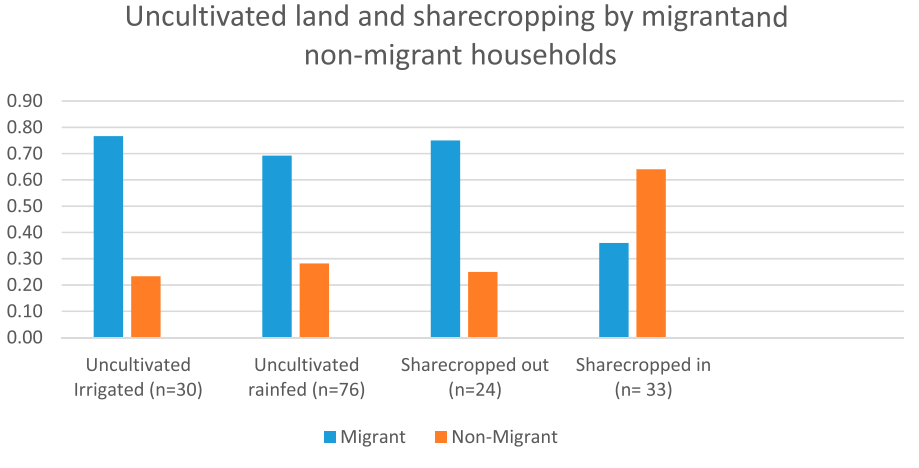

Figure 3. Percent of households with uncultivated and sharecropped land: Migrants and non-migrants.

Table 2. Descriptive statistics of household characteristics.

Variable	Full sample ($N = 244$)	Households with migrants ($n = 157$)	Households without migrants ($n = 87$)
Livelihood:			
Farm work	206 (84.43%)	128 (82.05%)	78 (88.64%)
Non-farm work	7 (2.87%)	7 (4.49%)	0.00**
Business	12 (4.92%)	7 (4.49%)	5 (5.68%)
N/A	19 (7.79%)	14 (8.97%)	5 (5.68%)
Number of trees:			
Fodder trees	39.94	53.47	15.97***
Timber trees	95.24	104.49	78.83
Fruit trees	10.18	13.14	4.94**
Total trees	145.36	170.18	100.59**
Bundles of firewood from own trees	34.99	39.32	27.31**
Bundles of firewood from community forests	21.05	20.42	22.16
Cooking fuel:			
Wood	130 (53.28%)	88 (56.41%)	42 (47.73%)
Coal	0.00	0.00	0.00
LP gas	5 (2.05%)	4 (2.56%)	1 (1.14%)
Biogas	0.00	0.00	0.00
Kerosene	0.00	0.00	0.00
Others	109 (44.67%)	64 (41.03%)	45 (51.14%)
Livestock:			
Buffalo	0.90	0.92	0.88
Goat/Sheep	4.28	4.71	3.52**
Cattle	0.82	0.89	0.70
Chicken	9.47	9.50	9.41
Land size (ropani):			
Owned land	16.18	16.85	14.99
Sharecropped in	0.43	0.41	0.47
Sharecropped out	0.55	0.68	0.32
Abandoned irrigated land	1.12	1.38	0.66*
Abandoned rain fed	1.43	1.45	1.41
Income (rupees):			
Farm income	55,695 (43%)	55,217 (40%)	56,543 (48%)
Non-farm income	35,072 (27%)	38,448 (28%)	28,980 (25%)
Remittance	11,914 (9%)	18,231 (13%)	716 (1%) ***
Business	9846 (8%)	9135 (7%)	11,108 (9%)
Other sources	17,952 (14%)	16,837 (12%)	19,966 (17%)
Total income	130,479	137,868	117,313**

Notes: Stars denote statistical significance in a *t*-test between households with at least one migrating member and those without a migrant at *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$. 11 ha = 20 ropani.

remittances and make significantly less income. At first glance, some of these results seem counterintuitive. Households that do not migrate have less cultivated and uncultivated land than do households with migrants; hence, they are less likely to grow trees on their land, and less likely to produce enough wood on their own land to burn. They may also be more actively engaged in farming activities and have insufficient labor to graze sheep and goats.

Of the 1409 people we recorded in the six villages, 990 individuals (70% of the village population) lived in 157 households with migrants and 419 individuals (30%) lived in 87 households without migrants (Table 3). The mean age of family members was approximately 32 years regardless of whether the households had migrants. Households with migrants had significantly more members (counting both migrants and non-migrants) than households without migrants. The average household with migrants had 3 migrants. Households with migrants were significantly more likely to be married and to be involved

Table 3. Village level demographic characteristics of individuals registered to households with and without migrants.

Variable	Full sample ($N = 1409$)	Households with migrants ($n = 990$)	Households without migrants ($n = 419$)
Mean age (years)	31.76	33.07	28.67
Mean family size	6.57	7.09	5.33***
Gender:			
Male	732 (51.95%)	518 (52.32%)	214 (51.07%)
Female	677 (48.05%)	472 (47.68%)	205 (48.93%)
Marital Status:			
Single	611 (43.36%)	412 (41.62%)	199 (47.49%) **
Married	735 (52.16%)	539 (54.44%)	196 (46.78%) ***
Divorced	1 (0.07%)	0.00	1 (0.24%)
Widowed	62 (4.40%)	39 (3.94%)	23 (5.49%)
Occupation:			
Farm work	525 (37.26%)	339 (34.24%)	186 (44.39%) ***
Non-farm work	228 (16.18%)	203 (20.51%)	25 (5.97%) ***
Business	74 (5.25%)	55 (5.56%)	19 (4.53%)
Student	442 (31.37%)	279 (28.18%)	163 (38.90%) ***
Foreign work	55 (3.90%)	55 (5.56%)	0.00***
N/A	85 (6.03%)	59 (5.96%)	26 (6.21%)
Livelihood:			
Farm work	602 (42.73%)	355 (35.86%)	247 (58.95%) ***
Non-farm work	151 (10.72%)	123 (12.42%)	28 (6.68%) ***
Business	45 (3.19%)	30 (3.03%)	15 (3.58%)
N/A	611 (43.36%)	482 (48.69%)	129 (30.79%) ***
Caste:			
Brahmin/Chhetri	508 (36.05%)	383 (38.69%)	125 (29.83%) ***
Newar	159 (11.28%)	138 (13.94%)	21 (5.01%) ***
Janjati	661 (46.91%)	409 (41.31%)	252 (60.14%) ***
Dalit	81 (5.75%)	60 (6.06%)	21 (5.01%)
Current Residence:			
Home	962 (68.28%)	543 (54.85%)	100.00***
Kathmandu	321 (22.78%)	321 (32.42%)	0.00***
Nepal	33 (2.34%)	33 (3.33%)	0.00***
Outside Nepal	68 (4.83%)	68 (6.87%)	0.00***
Unknown	25 (1.77%)	25 (2.53%)	0.00***
Education:			
Illiterate	177 (12.56%)	116 (11.72%)	61 (14.56%)
Literate	214 (15.19%)	149 (15.05%)	65 (15.51%)
Classes 1–10	735 (52.16%)	494 (49.90%)	241 (57.52%) ***
Classes 11–12	148 (10.50%)	121 (12.22%)	27 (6.44%) ***
University	100 (7.10%)	93 (9.39%)	7 (1.67%) ***
N/A	35 (2.48%)	17 (1.72%)	18 (4.30%)

Notes: Stars denote statistical significance in a *t*-test between households with at least one migrating member and those without a migrant at $*p < 0.10$; $**p < 0.05$; $***p < 0.01$.

in non-farm work. They are more likely to belong to Brahmin, Chhetri, and Newar households, and they are also more likely to live outside of the village and to work outside of Nepal. Finally, they are more likely to be better educated. Individuals from households without migrants are significantly more likely to be single and to live in the village. They are more likely to be involved in farm work and tend to be less educated. Consistent with the work of Yokying, Fox, and Saksena (Submitted), households with no migrants are significantly more likely to belong to the Tamang ethnic minority (Tibeto-Burman language group).

In Table 4 we examine the 157 households with individuals that migrate. Among these households we find 447 migrants and 543 non-migrants. Note that while individuals living in households with migrants made up 70% of the total population of the six villages,

Table 4. Individual migrant-level: demographic characteristics of individuals registered in home with migrants according to migration status.

Variable	Full sample ($N = 990$)	Individuals who have migrated ($n = 447$)	Individuals who remain at home ($n = 543$)
Mean age (years)	33.07	25.51	39.30***
Mean family size	7.07	7.69	6.57***
Gender:			
Male	518 (52.32%)	272 (60.85%)	246 (45.30%) ***
Female	472 (47.68%)	175 (39.15%)	297 (54.70%) ***
Marital Status:			
Single	412 (41.62%)	242 (54.14%)	170 (31.31%) ***
Married	539 (54.44%)	203 (45.41%)	336 (61.88%) ***
Divorced	0.00	0.00	0.00
Widowed	39 (3.94%)	2 (0.45%)	37 (6.81%) ***
Occupation:			
Farm work	339 (34.24%)	49 (10.96%)	290 (53.41%) ***
Non-farm work	203 (20.51%)	153 (34.23%)	50 (9.21%) ***
Business	55 (5.56%)	33 (7.38%)	22 (4.05%) **
Student	279 (28.18%)	148 (33.11%)	131 (24.13%) ***
Foreign work	55 (5.56%)	53 (11.86%)	2 (0.37%) ***
N/A	59 (5.96%)	11 (2.46%)	48 (8.84%) ***
Livelihood:			
Farm work	355 (35.86%)	86 (19.24%)	269 (49.54%) ***
Non-farm work	123 (12.42%)	86 (19.24%)	37 (6.81%) ***
Business	30 (3.03%)	13 (2.91%)	17 (3.13%)
N/A	482 (48.69%)	262 (58.61%)	220 (40.52%) ***
Caste:			
Brahmin/Chhetri	383 (38.69%)	158 (35.35%)	225 (41.44%)*
Newar	138 (13.94%)	66 (14.77%)	72 (13.26%)
Janjati	409 (41.31%)	201 (44.97%)	208 (38.31%) **
Dalit	60 (6.06%)	22 (4.92%)	38 (7.00%)
Education:			
Illiterate	116 (11.72%)	5 (1.12%)	111 (20.44%) ***
Literate	149 (15.05%)	25 (5.59%)	124 (22.84%) ***
Classes 1–10	494 (49.90%)	257 (57.49%)	237 (43.65%) ***
Classes 11–12	121 (12.22%)	79 (17.67%)	42 (7.73%) ***
University	93 (9.39%)	76 (17.00%)	17 (3.13%) ***
N/A	17 (1.72%)	5 (1.12%)	12 (2.21%)

Notes: Stars denote statistical significance in a *t*-test between households with at least one migrating member and those without a migrant at *$p < 0.10$; **$p < 0.05$; *** $p < 0.01$.

migrants make up only 45% of the population of households with migrants. We find that migrants are significantly more likely to be younger (25.5 years), come from larger families, and to be single men. They are significantly more likely to engage in non-farm work, business, employment outside of Nepal, or to be students. These migrants are significantly more likely to be Tamang (Janjati) and not Brahmin or Chhetri. Migrants are significantly more likely to be educated at all levels of education. Individuals from migrant households that do not migrate are significantly more likely to be older (39 years), from smaller families, and to be married women. They are significantly more likely to engage in farm work or to be listed as N/A (unemployed, mainly elderly people). They are statistically more likely to be Brahmin or Chhetri, and to be less educated.

Discussion

This study had three objectives. The first objective was to summarize differences between a 1992 survey of six sites in Sindhu Palchok and Kabhre Palanchok that were part of the

Nepal-Australia Forestry Project, with a survey conducted of the same six sites in 2017 and to place these differences into the context of the decoupled agrarian question of labor proposed by Bernstein (1994) and furthered by Blaikie et al. (1980, 2002); and Rigg (2006).

Between 1992 and 2017 these six villages experienced major changes. These include the development of an extensive road network, the initiation and continued implementation of a community forest program, a steady rise in the numbers of CFUGs, and the outmigration of people of all ages and genders, but particularly young men, to live and work elsewhere in Nepal or abroad. Farms became smaller, but still farmers left 16% of their land uncultivated. They diversified the crops to grow more commercially important crops, and they kept fewer large livestock. They also began to diversify their sources of cooking fuel to include LPG, biogas, and other forms of energy.

Our results reflect the fact that Nepal has an agrarian economy; thus, farming, especially subsistence farming, remains the mainstay of livelihoods for most rural households regardless of their migration status (Gautam and Andersen 2016). Although farming contributes substantially to rural livelihoods, farmers in the six villages and other communities across the middle hills of Nepal are beginning to diversify their livelihoods and to decouple their lives from farming. Farmers are becoming increasingly dependent on non-farm wage labor both within and outside of the country as a major source of income. While farms are becoming smaller and farmers are leaving more land uncultivated, there is little evidence that farmers seek to sell their land. In fact, farming remains an important component of their livelihood strategy – it just is no longer the only component. In addition, farmers no longer grow crops for subsistence but for both food and markets.

While Bernstein's (1994) argument about the decoupling of labor from capital may overstate or even foreshadow the reality we observed in these villages. Rigg's (2006) arguments about the processes and trends affecting the transformation of agriculture finds support in these villages. People are diversifying their occupations and livelihoods both within the village and further afield. They are adopting multiple modes of producing income including both on and off farm activities. In migrant households, incomes are shifting from farm to non-farm sources, but even in non-migrant households an increased share of their income comes from non-farm sources. Their livelihoods have become more mobile and delocalized, and remittances play a growing role in household incomes. Farmers are aging, and cultural values are changing, as young people are eager to find a diversity of ways to earn a livelihood. Our data support's Blaikie, Cameron, and Seddon (2002) argument that it is difficult to identify markets for commodities produced in Nepal that could bring in the same returns as migrating labor. The qualitative interviews suggested the Maoist civil war induced many young men to leave the area in order to not become involved and the protracted political instability caused a neglect of policies favorable to farming – thus furthering the decoupling of labor from farming (see Le Billon 2000 for a similar process in Cambodia).

The second objective was to summarize changes in tree cover in the same six VDCs between 1995 and 2015 based on a national mapping project of which the authors were collaborators and to place these changes into the context of the forest transition theories. The study sought to correlate changes observed in the 1992 and 2017 surveys with changes in mapped tree cover.

We found support for all three of Meyfroidt and Lambin's (2011) pathways: global markets (particularly labor) and ideologies were associated with increased forest cover, the government's community forest management policy was associated with increased forest cover; and finally, smallholders were affecting forest cover both through participation in community forest programs but also through planting fruit orchards, woodlots, agroforestry systems, gardens, hedgerows, and allowing secondary successions on abandoned lands.

The mapping exercise documented a significant increase in tree cover in these villages between 1992 and 2017. We observed a number of variables that have a strong association with these changes. These include the establishment of a successful community forestry program by both indigenous and exogenous forces; the out-migration of people of all ages and genders, but particularly young men, to live and work elsewhere in Nepal or abroad; and farms becoming smaller, even while farmers left 16% of their land uncultivated and allowing forests to regenerate. Farmers are diversifying the crops they grow to include more commercially important crops, and they keep fewer large livestock. They also began to diversify their sources of cooking fuel to include LPG, biogas, and other forms of energy.

We noted that Nepal had a long history of communal management of forest resources practiced by all ethnic groups, which only ended in 1951; this history provided a framework for villagers to quickly implement community forest management. We further noted that Cronin (1979) and Fox (1984) documented that while villagers in eastern and central parts of the Middle Hills degraded their forests, they but did not allow anyone to convert them to private uses; this suggests these lands remained common property even after 1951. Once villagers learned that the government was allowing community management of forest lands, they rapidly established informal management programs; often several years before they were established officially by forest rangers (Fox 2018). We suggest that a recent history and culture of common property management is a forest transition pathway that has not been explored in the literature. Meyfroidt and Lambin's (2011) hypothesis about the importance of state forest policy, including various forms of community management, as a forest transition pathway should reference the importance of a recent history and culture of common property management that can enable communities to adapt community forest management practices quickly.

Lastly, the study sought to examine how land use is changing in response to migration and other factors, and the implications these changes hold for the future of trees and agriculture in the six sites. We sought to place these into the context of the 'ecological agrarian questions' raised by Akram-Lodhi and Kay (2010).

In 1992 we found that only 11% of people from these villagers were living elsewhere, whereas in 2017, one-third of household members were living outside the village. We also found that farmers today own less land today than in 1992 and that they are leaving some of that land fallow because the returns to labor, now a scarce resource, are not sufficient to make it worth investing it in utilizing the land. Farmers also began to diversify their sources of cooking fuel to include LPG, biogas, and other forms of energy. These changes in migration patterns and the diversification of household sources of income have allowed a doubling of tree cover in these villages during this twenty-five-year period. These findings support Akram-Lodhi and Kay's (2010) argument that changes in agrarian practices have ecological implications.

The fact that our results differ from previously published studies shows the diversity of ongoing processes in Nepal and highlights the fact that migration and land-cover change are playing out differently across the country. The impacts of migration on forests and agriculture vary widely and researchers and policy makers still debate the impacts out migration have on rural land-use transitions. These impacts are neither uniform nor permanent and it is essential to consider the local context in designing location-specific policies and interventions for sustainable resource use and management. Our findings do not agree with some of the recent literature on migration and land use in Nepal (see Bhandari 2013; Khanal et al. 2015; Ojha et al. (2017)). On the other hand, these findings support Akram-Lodhi and Kay's (2010) and Thompson, Rigg, and Gillen (2019) arguments that the agrarian question does not simply constitute a single straightforward question but plays out differently in diverse places and times.

Conclusions

We conclude with two major findings from our observations in these six villages. First, we find that forest and tree cover have increased tremendously and that farmers are less reliant on forests and forest products for their livelihoods, and there is no reason to believe that this trend will reverse. Stable and perhaps even growing forest cover will be part of Nepal's landscape for the near future. This is due to successful community forestry programs, the fallowing of marginal lands, and the outmigration of a significant portion of the population. Second, farmers are farming less land, but this does not mean the end of agriculture. In these six villages, which sit on the edge of Kathmandu valley, we find that farmers grow crops that have greater commercial value, and with the development of the road infrastructure, they have developed value-added chains for marketing their goods in Kathmandu and other nearby towns. The picture of occupational multiplicity described by Rigg (2006), where households create a nexus of activities, some farm and other non-farm, some highly commoditized and other quasi-subsistence, some on the farm and others elsewhere may be a stable situation for these villages. As a quintessential feature of agrarian transition, livelihood diversification in the form of occupational multiplicity is widespread and found in not only our sample areas, but also other regions including Asia (see Rigg 2006; Rigg et al. 2018), Sub-Saharan Africa, and Latin America (Loison 2015; Kay 2006). While its close proximity to and easy access to markets in the Kathmandu Valley may facilitate occupational multiplicity, this may not be feasible in many parts of the country. Fox (2018), for example, noted the difficulty that farmers in a village near Gorkha met in trying to find a high value agriculture commodity. They invested time and money into producing chickens, oranges, and coffee only to face problems of pests, disease, and market access.

In 2015, the Government of Nepal endorsed a multibillion-dollar agricultural development strategy. This project suggests that the future of sustainable agriculture in the Middle Hills of Nepal depends on the development of road infrastructure to get agricultural goods to markets. It also depends on the identification and promotion of crops that farmers can sell at prices that make it worthwhile for them to stay in their fields, with the recognition that commercial crops often go through boom-and-bust cycles. Policy makers also need to promote the development of nearby off-farm and non-farm job opportunities that allow family members that wish to remain employed nearby to do so. Planners

should develop land use (agriculture and forest) policies selectively depending on local context, in order to promote economic growth and sustainable agricultural practices more effectively. Such a plan might promote mixed agroforestry systems, community-based farming, and cropping in areas where there is potential to develop value-added market chains. It should also provide financial incentives (e.g. soft loans or village-based banking and loan systems), and technical supports that enable farmers to continue farming while adopting approaches that require less labor and other inputs.

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