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Why is farming important for rural livelihood security in the global south? COVID-19 and changing rural livelihoods in Nepal's mid-hills

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Over the last three decades, Nepal has experienced a rapid transition in rural livelihoods, from largely subsistence farming to more diversified off-farm employment and remittances. Despite this, subsistence farming continues to be a central part of rural production. Why does farming persist in the face of other, more remunerative, off-farm employment options? In this article we argue that subsistence food production continues to be important for rural livelihood security by providing food needs from farming, thus helping households to cope with uncertainties in off-farm employment and international labor migration. Taking the COVID-19 pandemic as an example of a high level of livelihood stress, the paper provides insights and further explanations on the logic of maintaining subsistence food production as part of rural households' livelihood security. Drawing on in-depth qualitative study, complemented with a quantitative survey from eight villages in rural Nepal, we examine the impact of the pandemic on farming and off-farm activities and explore the reasons behind peoples' choice of livelihood strategies and how these vary between different social groups. We show that there was only limited impact of the dramatic disruptions caused by the global pandemic on subsistence farming, however it brought substantial challenges for emerging semi-commercial farming and off-farm incomes, including both local and migratory wage labor. During the pandemic, people increased their reliance on locally produced food, and subsistence farming served as a critical safety net. Our analysis underscores the continued importance of subsistence production amidst contemporary shifts toward off-farm employment among rural households. We also find a growing interest in semi-commercial farming among farmers with better access to land who seek state support to develop such production. This suggests that it is important for agricultural development policy to recognize and support subsistence farming alongside emerging commercial agriculture production as an integral foundation of future farming and rural livelihood security.

KEYWORDS

subsistence production, food security, smallholder farming, migration, Himalaya, mountains

1. Introduction

Nepal's rural areas have undergone rapid transition over the past three decades with a significant move toward more diversified and off-farm livelihood strategies. Migration to cities and abroad has become a major phenomenon since the 1990s, and remittances have become a major source of income for many rural households (see Sunam, 2020). These trends have been driven, at least in part, by growing stress in farming due to declining farm size, shortage of farm labor, and the effects of climate change (Ensor et al., 2019). At the same time, outmigration has provided new opportunities for cash income that was not available in the past. However, despite the overall decline in agricultural dependence in rural areas (Ojha et al., 2017), reports suggest that rural people continue engaging in farming (subsistence or semi-commercial) to support their livelihoods (Chhetri et al., 2021; Sugden et al., 2021). A growing body of research suggests that off-farm employment, particularly labor migration, involves high levels of uncertainties with unstable incomes and precarious work conditions and therefore entails a need to maintain farming in parallel (Rigg et al., 2016; Sunam, 2020; Sugden et al., 2021).

These trends have been exacerbated by the COVID-19 pandemic. Following dramatic lockdowns, many countries–especially in South Asia–saw a large reverse migration of off-farm laborers into rural areas (Gupta et al., 2021; Kumar et al., 2021). Growing research shows that the sudden loss of jobs and income has resulted in increased food insecurity of rural households (Workie et al., 2020; Adhikari et al., 2021; Gupta et al., 2021), while also compromising smallholder agricultural production due to inaccessibility of inputs and markets (Adhikari et al., 2021; Kumar et al., 2021). Our work builds upon this research to explore what we can learn from the COVID-19 pandemic about rural agricultural systems. Using the COVID-19 pandemic as a lens, our analysis below provides further empirical evidence on the role agriculture as a basis of rural livelihood security, and we explore some of its lessons for agricultural policy.

Drawing on detailed qualitative data from two contrasting villages of a mid-hill district of Ramechhap and a survey conducted in eight villages in Kavre and Ramechhap districts, we investigate the impact of COVID on farming and draw lessons from the pandemic for the future of farming and farmed-based rural livelihoods. Given the large-scale disruptions following COVID-19, it has potential to generate valuable analytical and policy insights for the future of farmed-based rural livelihoods in the Global South. The key insight of this paper is that the subsistence farm production plays a fundamental role in enabling households to cope with diverse shocks and stressors. While agricultural policy in Nepal and elsewhere has primarily favored support for commercial farming, the significance of subsistence food production is often overlooked (Sijapati et al., 2017; Gupta et al., 2022). Drawing insights from our analysis, the conclusion argues that policy support for both subsistence production and commercial crops is important to support secure and prosperous farming futures amidst contemporary social and economic changes in rural areas of the global south.

Indeed, the Nepalese case exemplifies many prominent trends in agrarian change in South Asia and other parts of the world (Sunam and McCarthy, 2016; Rigg, 2020; Subedi et al., 2021). Growing stress on farming has pushed rural households to look for off-farm employment opportunities. However, the off-farm employment options are also not providing reliable income to sustain household livelihoods. Consequently, rural households continue to use farming as an important source to mitigate the risks of such uncertainties and combine farming with off-farm employments such as labor migration (Rigg et al., 2016; Chhetri et al., 2021). Such situation, when households need to engage in both agriculture and labor markets, has been described as a scenario of progression in sideways (McCarthy, 2020). The growing trend of labor outmigration from rural areas has been reshaping household labor dynamics and land uses. With shortage of family farm labor, households are often unable to manage the farm as before, and therefore keep part of their productive land in production while deactivating other farmland (Maharjan et al., 2013; Adhikari and Hobley, 2015; Ojha et al., 2017; Sunam, 2020). Some have predicted that remittances might be invested in entrepreneurial agriculture, as happened in Indonesia (Peluso and Purwanto, 2018) and some Central American countries (Davis and Lopez-Carr, 2014; Radel et al., 2018). In Nepal, however, only a very small fraction of remittance has been reinvested in agriculture (Sunam and McCarthy, 2016; Jaquet et al., 2019).

The next section briefly outlines the methodology, where we provide context of our study sites and present the methods used to collect data. Section three provides a brief context of changes in rural livelihoods in the Nepalese mid-hills situated in the broader context of transitions in rural livelihoods in the Global South. Thereafter, lived experiences of COVID-19 related measures in rural areas and implication for managing household level food security are presented in section four. Section five focuses on the impact of COVID on farming and what COVID meant for peoples' decision on future livelihood options. We discuss the findings in section six, focusing on what insights the COVID pandemic can offer to better explain the rural change. We conclude the paper by drawing some analytical and policy implications.

2. Methods

This paper is primarily based on qualitative research involving intensive field work in two contrasting villages from Ramechhap district (Table 1). Our qualitative analysis aims to provide rich, place-based data on experiences and impacts of COVID-19 and associated economic disruptions on household farming strategies. Additionally, we complement these insights with descriptive analysis of data derived from household survey, comprising 240 households from eight villages from Ramechhap and Kavre districts (see Table 2; Figure 1). Overall, we center our analysis on qualitative insights, yet our survey data provides additional information to illustrate generalizability of some key trends to a large sample of households in the region. Together, our data sources reveal different aspects of agriculture and food security during the COVID-19 pandemic, which allow us to paint a

TABLE 1 Key features of two in-depth case study sites.

Site/description	Altitudinal range	Geography	Weather conditions	Farmland and productivity
Khimti	625–1,500 m	V-shaped valley and upland area	Receive more rain compared to Chyasku, good irrigation facilities	Good quality *khet*[a] land in the valley and *bari* land in upland areas
Chyasku	1,500–1,900 m	Located on a ridge, fields located in slopes	Dry area as it receives limited rainfall, water is a major stress	Mostly *bari* land with two crops during and after monsoon period

[a] *Khet* is integrated terraced land for paddy production and *Bari* rainfed sloppy land.

TABLE 2 Description of the survey sites.

Village	Palika and district	Key features
Chapakhori	Temal RM, Kavre	Located in mountain slops (∼85 Km from Kathmandu) with sub-tropical semi-arid climate. High out-migration rate, predominantly subsistence food production (sufficient for <6 months).
Robi Opi	Dhulikhel M, Kavre	Located in north-facing slopes (25 km east from Kathmandu) with sub-tropical and humid climate. Both irrigated (khet) and non-irrigated (bari) land. Majority of households involved in commercial vegetable cultivation and milk production.
Khanidanda	Ramechhap M, Ramechhap	Located in southeast slope (150 km east of Kathmandu) in semi-arid temperate zone. Largely subsistence farming with water as scarce resources and people sell some surplus (lentils, fruits and vegetables).
Bhorle (Lyanglyang bazar)	Ramechhap M, Ramechhap	Located at about 145 km east of Kathmandu, sub-tropical climate and semi-arid zone. High level of out-migration and largely subsistence farming (sufficient for only 3∼6 months) and some level of semi-commercial vegetable cultivation.
Bimire, Rasnalu	Gokulganga RM, Ramechhap	Located in temperate zone (170.4 km east of Kathmandu) with higher rate of precipitation (about 263 mm). Largely subsistence farming and some households started commercial farming (kiwi, vegetables).
Pharpu	Gokulganga RM, Ramechhap	Located at 150 km east of Kathmandu with subtropical to temperate climate. Subsistence farming (most HHs produce sufficient food (from Khet and Bari), relatively lower migration, water is not an issue.
Yangbel	Temal RM, Kavre	Sem-arid zone with sub-tropical to temperate climate, located 71 km away from Kathmandu. High migration rate, mostly subsistence farming. Water is scarce for even drinking.
Kalche	Dhulikhel MP, Kavre	A valley with humid sub-tropical climate located at 36 km east of Kathmandu. Most of the households involved in commercial farming, sufficient water for drinking and irrigation.

broader picture of the impacts of COVID-19 on farmed-based rural livelihoods.

The two in-depth qualitative study of Khimti and Chasku (mid-hills region) vary in terms of socio-economic and biophysical conditions (see Table 1). Khimti, located in a valley has flat and productive land for agriculture and less exposed to rainfall risks because of irrigation and higher level of precipitation. Whereas, Chyasku is located on mountain slopes with marginal productivity as it has no irrigation facilities, and the region is located in semi-arid region. Both sites have a significant level of adult outmigration and hence a shortage of farm labor.

Qualitative data collection in these sites were carried out during the COVID induced travel restriction periods of 2020 (August-September). Given these constraints, we used a combination of virtual communication and in-person fieldwork. Trained local research staff arranged telephone interviews with villagers and researchers in Kathmandu then conducted the telephone interview following a checklist. Semi-structured interviews were conducted with selected households (28) and key informants (9). Of these, about half were carried out from a distance and rest were done in person (through field trips in both 2020 and 2021). The households were selected to represent different social groups, and we deliberately included a majority of households with recent migrant returnees (either returned from national cities or abroad). Key informant interviews were conducted with knowledgeable persons in the villages which included *palika*/ward representatives, CFUG leaders, schoolteachers, commercial farmers, local businesspersons, and youth entrepreneurs. With them, we intended to understand the impact of COVID on farming and peoples' future livelihood strategies.

A follow-up visit was conducted in these two qualitative case study sites in September 2021 when we conducted five household-interviews and four group-interviews in two villages. In the follow up visit, we explored how people experienced the second wave of the pandemic, its impact on farming and people's choice of livelihood options throughout this time.

Our survey was carried out in eight villages in two mid-hills districts of Ramechhap and Kavreplanchok (see Table 2). The villages were selected purposefully considering socio-economic, environmental, and agricultural dimensions. Consequently, they have both similarities and differences in terms of key aspects such as the intensity of migration, social composition, land uses and local environmental conditions. While most of the sites are located in rural areas, two sites (Rabi Opi and Kalche) are close to urban centers. Some villages have irrigation facilities with higher levels of agricultural productivity, while others are located on mountain slopes, with significant water stress and frequent damage to crops from wildlife. All sites have a significant level of adult outmigration and hence a shortage of farm labor.

In total, 240 households were selected randomly from population registers in each village (30 households per village). These surveys were conducted by trained field staff starting in

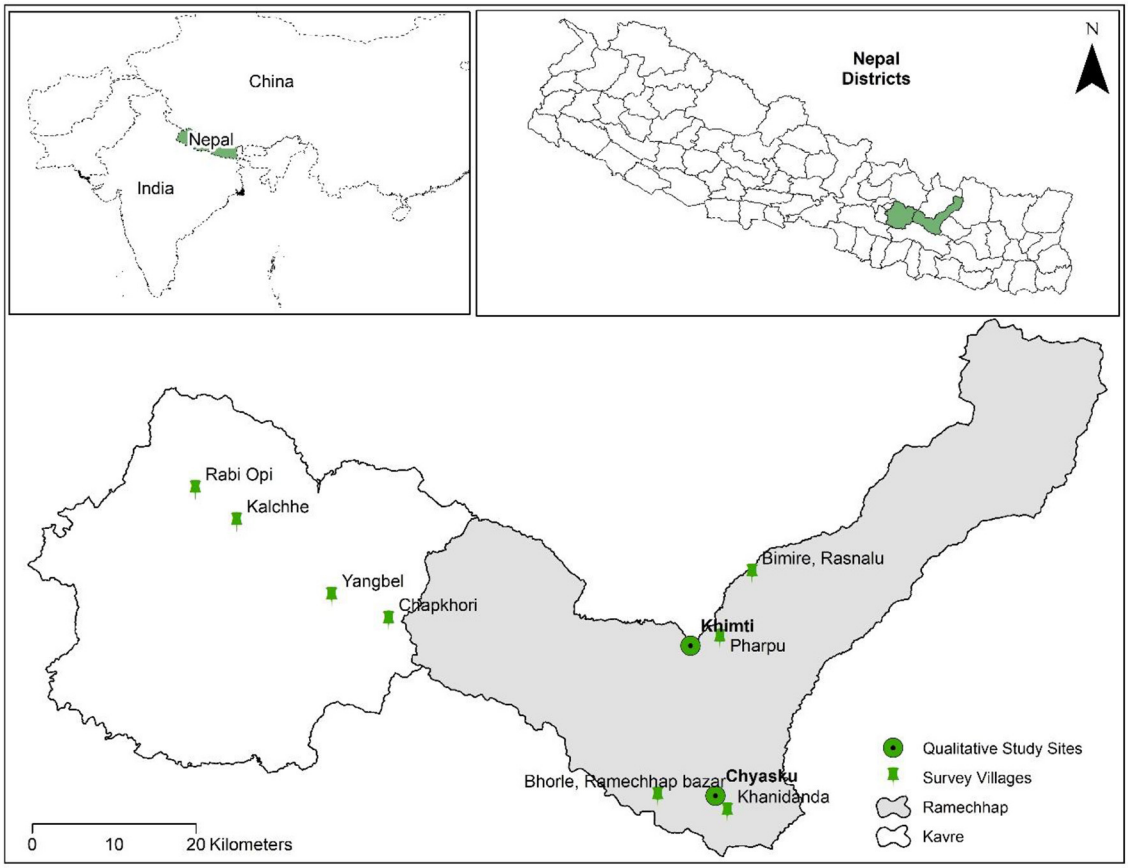

FIGURE 1
Map: Case study and quantitative survey sites.

May of 2020, roughly 2.5 month after the initial lockdown. We revisited the households approximately monthly over the coming year, allowing us to capture data on ongoing impacts of COVID-19 disruptions and examine general trends in household responses. We focus this paper on data collected in months of June through August, which coincided with the first monsoon planting season following COVID-19.

Since our primary objective is to situate the qualitative data within broader trends across the study region, our data analysis is primarily descriptive complemented with some bivariate analysis to test the generalizability of observed associations. We used the statistical program R, version 4.1.3 for data analysis and the visualizations were developed using *ggplot* version 3.3.5, and lattice version 0.20–45.

3. The context of changing rural livelihoods

In the past (until the late 1980s), while commercial agriculture existed in some pockets near to larger cities, subsistence farming was nevertheless the mainstay of the rural economy throughout most of Nepal. Most of the rural households produced food for their daily needs and some who did not produce sufficient food would cover periods of food scarcity with agriculture wage labor in the village or went for long periods of work outside the village. Our study areas broadly follow these trends. For example, we learned from the qualitative fieldwork that until the 1980s most households in the dry landscape of Chyasku produced food only sufficient for less than half of the year and therefore members of many households had to work as porters. They carried rice and other commodities from Tarai, on the mountain paths to the local markets in Ramecchap to make their families survive. Others went for longer periods to work in coal mines in India. In contrast, households in Khimti had access to irrigated fields that produced sufficient food for the whole year and relatively few villagers were involved in non-farm activities at that time.

Throughout much of Nepal, as in our study area, the rural economy has changed dramatically over last 30 years with diversification of livelihood options. These changes were driven by the market integration leading to demand for cash income in one hand, and increased stress on farming because of declining farm sizes and other climate and non-climate related stressors, on the other hand. Since 1990, foreign labor migration has become a strategy to sustain households' livelihoods (Sugden et al., 2021; Sunam et al., 2021a) and remittance has become a key source of income, both nationally as well as within the rural economy. A national survey (CBS, 2019) estimates that 2.8

million Nepalese went abroad for work during 2017 and 2018 (Baniya et al., 2020). This means that one out of five Nepalese (primarily men) in working-age (between 15 and 64 years) are engaged in foreign labor migration (Sunam, 2020). The total sum of $7.8 billion of remittance received in this period is equivalent to around 25% of Nepal's GDP (Banco Mundial, 2020). Such large scale of migration means that remittances today provide a main source of income to many rural households and that many villages have turned into what Sunam (2020) termed as "remittance villages," a condition where "remittance incomes have increasingly become more important than agrarian production for household reproduction" (Sunam, 2020, p. 4).

The average farm in Nepal is 0.7 ha[1] and as our survey showed in our case study villages it is 0.4 hectare, which is far too small for sufficient food production for most families. In Nepal, traditionally the parents' holdings are inherited between the sons, so land becomes even smaller for each generation. The decreasing farm sizes, ongoing rural out-migration and shortage of farm labor and other associated changes such as climate change impacts and problem of damage of crops by wild animals are pushing multiple changes in in rural livelihoods. Yet, rural households continue to engage in farming and food production. In other words, most of the rural households combine food production with other off-farm employments to sustain livelihoods. In recent years, some rural households have also started semi-commercial farming. They grow some cash crops such as vegetables to sell in the nearby market alongside producing food to meet the daily needs of the family. For example, in our case study village of Chyasku farmers sell beans and vegetables and raise smaller livestock such as pig and goat. Similarly, in Khimti villagers produce rice, milk, vegetables and sale the surplus. Among the eight villages we conducted the quantitative survey, the two villages closer to urban areas, Rabi Opi and Kalche, are involved in more intensive commercial production of vegetables and milk.

In much of rural Nepal, there is an increasing trend of idling[2] of land in areas where farmers are facing growing stress of labor shortage. For example, in the upper slope of our study site Khmiti which consist of rainfed Bari land, people are leaving farmland fallow and moving into more extensive land use such as fodder areas (*pakho*) and growing trees (Poudel et al. under review in Human Ecology). Our survey gives a broader sense of the overall magnitude of this decline in area of land under cultivation per household: it shows a median of 0.408 hectares in 2010 (10 years before our survey) which is down to 0.255 hectares by 2019 (the year before COVID-19)–a roughly 40% reduction, as we explore more in the text to follow. Indeed, idling farmland has become a growing phenomenon across Nepal and some reports suggest that up to 30% of the agricultural land has been omitted from the annual production systems in a certain part of the country (Adhikari et al., 2021; Subedi et al., 2021). The phenomenon of idling land has been seen as important challenge for domestic food production and food security as farmers move from labor intensive cropping production to more extensive practices such as growing fodder and in many cases, or even in some cases completely abandon farmland (Adhikari and Hobley, 2015; Ojha et al., 2017).

It is in this context of changing dynamics in rural livelihoods involving intertwined processes of migration and land use transition, the COVID pandemic landed in February 2020 posing an unprecedented challenge to rural livelihoods. Below we elaborate on how rural people experienced the pandemic and what impact it has left on rural livelihoods.

4. Experiences of the pandemic and food insecurity in rural Nepal

The measures taken by Nepalese government to contain the spread of the Coronavirus during the first wave of the pandemic included nation-wide lockdown during March-May and travel restrictions until September 2020. Mobility of all kinds of vehicles was restricted except for essential services such as ambulance, press, medical persons and food supply. In the villages, schools, offices and market centers were closed and public gatherings were restricted. Many local governments (*palikas*) also took their own initiatives to seal local borders from outside visitors, for example by blocking bridges, mobilizing volunteers in the major entry points to the *palika*. Yet, in the agricultural fields, villagers continued working with their crops as this was the time of year when they sow their maize and transplant paddy.

Due to the national lockdown, many villagers working in urban centers lost their daily income and had to return to their respective villages. Some of them returned just before the lockdown in anticipation of it, while others walked part of the distance and later continued *via* transportation arrangements made by local governments. This had a significant impact on a large number of households; on our survey villages, 37.5% of households (90 households of 240) had one or more household members that returned in the first 2 months of the pandemic. The restrictions in mobility and halting construction activities also meant that villagers depending on daily wage labor (e.g., in their villages and nearby towns) lost their income. A man in his mid-40's from Sunuwar ethnic group reported: "To be honest, we had more fear of famine than Coronavirus during the lockdown. I have a small amount of farmland (2-3 ropani, 0,1 ha) and I used to live from daily labor work. But (now) it is impossible to find work here."

The COVID situation also affected people working abroad. People depending on family members sending remittances faced difficulties due to reduced income, and some even stopped receiving money during certain periods. Individuals working abroad (e.g., the Persian Gulf countries and Malaysia) faced problems such as losing their job or being reduced to part-time work; many were stranded with limited support provided by the employers. A woman whose husband was stranded in Dubai mentioned:

1 The average size of agricultural landholding is 0.7 hectare in rural areas and 0.5 hectare in urban areas. Five percent households do not own any land but work other people's land on a contractual basis (Nepal Living Standards Survey, CBS 2011).

2 Idle land is a deactivated land (mostly *bari, pakhobari and kharbari*) which has low economic potential, but farmers extensively use it for fodder and timber production. These are idled because farmers choose to invest less labor in such land, instead they prefer to invest on land having access to road, irrigation, and market.

> My husband is in Dubai. He has not received a salary for months but is still working part-time. He stopped sending money home. I am happy that he is well and surviving with some support from the company [that employs him]. I hope he will receive payment as he has continued working.

Our household surveys affirmed that food insecurity was common across the sites. In our first survey in May-June 2020, ~2.5 months after the initial lockdown was initiated, 37% of households reported "some" difficulty in getting enough food for their family, and 7% reported "significant" difficulty (Figure 2A). Unsurprisingly, these experiences vary across our broader sample. Figures 2B, D shows how food insecurity was far more acute for lower caste households (Chisquare test, $p < 0.0001$), households with smaller landholdings (spearman rho = 0.147, $p < 0.0001$), and those who derive a larger proportion of total household income from wage labor (spearman rho = 0.147, $p < 0.0001$) (Figures 2A–D).

These variables—caste, off-farm income, and land size—are common markers of socio-economic status in rural Nepal, which point to the highly differentiated experience of impacts across segments of society. Caste reflects entrenched patterns of social marginalization and *Dalit* (lowest in the caste hierarchy and considered as untouchable groups) have smaller landholdings. Wage laborers are often households with higher levels of poverty and fewer productive assets in our study area. Wage labor is typically insecure and often seasonal (for example agriculture or local construction projects when available); overall local wage labor was highly disrupted during the COVID lockdowns. Likewise, those with less land have overall higher levels of poverty, and often have smaller food stores from previous production, which also likely exacerbated food security challenges. Importantly,

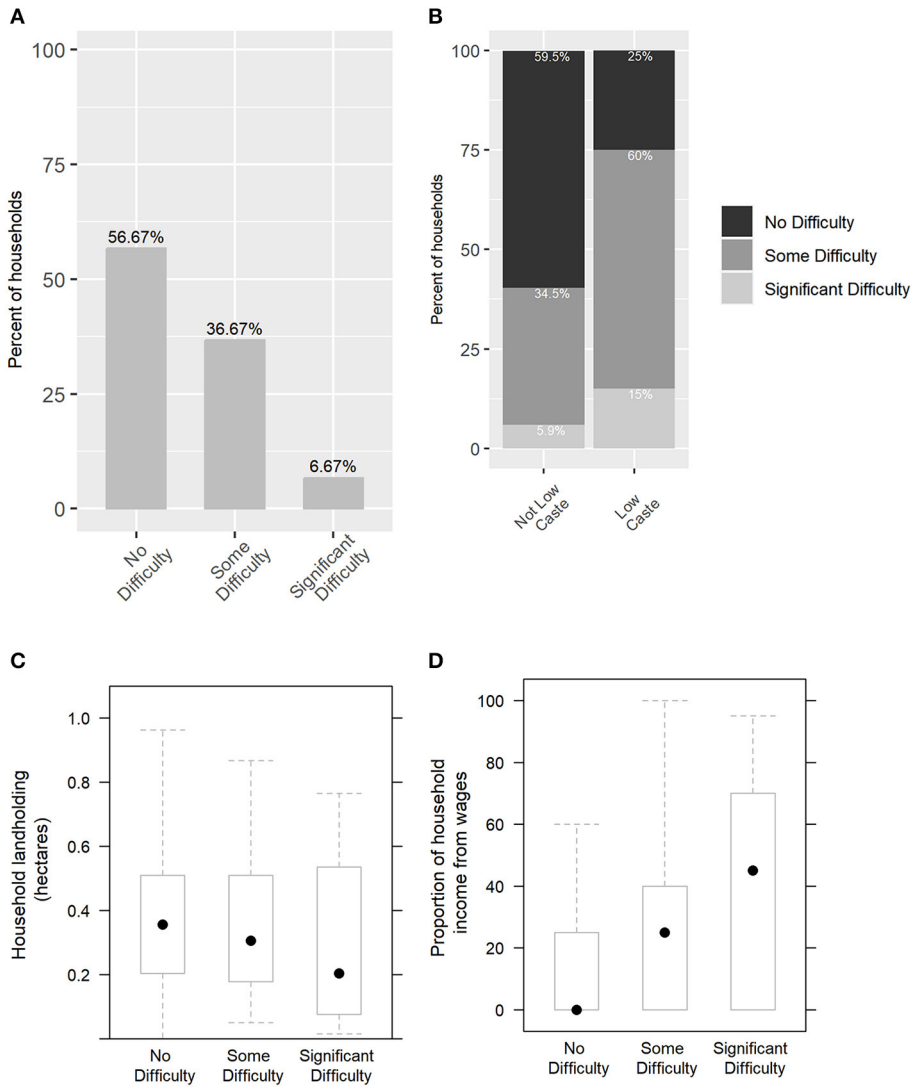

FIGURE 2
Experiences of food insecurity. Households reported "no," "some," "significant" difficulties in accessing sufficient food in the 2 months following the initial lockdown in 2020: **(A)** in overall percentage; **(B)** across caste groups; **(C)** by proportion of income from wage labor; **(D)** according to landholding size. General castes in **(B)** represent higher castes such as Brahmin and Chhetri and Janajiti.

these three variables are often highly correlated i.e., land poor households often rely more heavily on wage labor, for example. Our main point here is simply to show that experiences of food insecurity were widespread and concentrated especially–but clearly not exclusively–among more marginal groups.

The qualitative data indicates that disruption in off-farm income had longer-term financial implications for some households. The households who did not have sufficient food production or storage from the previous productions had to borrow money to buy food. A few households described that they used their savings to meet daily needs and others needed to borrow money. Some borrowed from family and friends and others turn to money lenders or local cooperatives, often with very high-interest rates. As they reported, the cooperatives charge up to 18% of interest, the local money lenders charge between 24 and 36% per annum (whereas, the interest rates of commercial banks ranged from 9 to 11%), it is easy to understand how a loan taken to address acute problems can become a burden that compromises financial stability well into the future. For example, about one-third of the interviewed households (qualitative interviews from both sites) have reported an increase in loans taken during the lockdown period. This means, for some households, the loss of job or income has generated longer-term effects in terms of household wellbeing.

Despite challenges, many migration returnees reported that they were happy that they could meet and spend time with family. In some contexts, there were even reported to be small celebrations in the villages with good food and family gatherings. However, as the lockdown period extended, many households felt increasing stress to feed the increased number of family members living at home. A high caste man in his 50's reported:

> We are now 5–6 members in the family and household expenses have grown compared to normal. The food stock that was kept for the whole year as well as for special festivals such as Dashain and Tihar has been almost finished since my sons have returned home. The situation might be worse for people who have larger families than ours.

Additionally, an increase in food prices further stressed many households to feed the family. Although we were not able to systematically capture commodity prices quantitatively, in our qualitative interviews households often spoke of a significant increase in food price during the lockdown period-with reported price increases of up to 30–50% on some commodities, such as rice and cooking oil.

In the follow-up field visits in September 2021 we learned that people developed some level of confidence living with the pandemic. Though there were more people infected in both villages in the second wave in 2021, the lockdown was less strict, people were more comfortable about measures such as wearing face masks, using sanitizer and using physical distancing and people had a lower level of fear and anxiety compared to the first wave. Despite this, respondents reported that the increase in basic food prices continued.

How did households respond to these challenges? Our survey data showed a slight increase in subsistence food consumption within the overall food bundle following the initial lockdown. In our first survey (2.5 months after the first lockdown), we asked households to report the proportion of total household food derived from subsistence production vs. other sources (e.g., market, state food support) over the previous year (June 2019-May2020). In repeated surveys (approximately monthly), we then asked the same regarding food consumption over the month preceding our visit (through months June-December 2020).

Figure 3 depicts these trends. In June, households reported patterns of food consumption roughly equivalent to the previous year on average. However, as the pandemic wore on, the amount of food derived from subsistence production increased in August and October before reducing again in November and December. This is interesting since it suggests that challenges of accessing sufficient food were not simply the result of disruptions in transport of food to villages; despite initial challenges of accessing markets after the lockdown, dependence on self-produced food was in fact greater in the succeeding months–as cash reserves became increasingly stressed and households had fewer alternative options available.

In short, pandemic restrictions generated challenges for accessing food for a large proportion of the population, especially poorer and more marginal groups Amidst continued disruptions, consumption of self-produced food appears to have become more important for households' overall sustenance. Thus, even though most families continued to depend on food from other sources, our data points toward the important contributions of subsistence food production for household security when other food and income sources are disrupted or run out.

5. COVID impact on farming and future livelihood strategies

5.1. Impact on farming

Interestingly, our data suggests that COVID-19 has not had a significant impact on farmers' decisions to cultivate their land. However, we do find evidence that it influenced farmers' decisions of which crops to grow, at least in the short term.

Figure 4 from our survey data shows that households' total land under cultivation declined on average from 2010 (10 years before our survey) until the present (t-test, diff. of means $= -0.141$, $p < 0.0001$). We see a marginal increase between 2019 (the year before the pandemic) and our surveys during the 2020 pandemic. Between 2019 and 2020, a few households (20 of 240, e.g., 8%) report marginal increases in their total area under cultivation (between 0.02 hectares and 0.25 hectares increase per household) (t-test, diff. of means $= 0.007$, $p = 0.036$). Overall, these trends point toward a broad decline in farming over the past 10 years, as households have gravitated toward off-farm income earning opportunities. Compared to these broader trends, the increase in overall cultivation since the pandemic is marginal indeed.

Our qualitative data paints a similar picture. Overall, the interviewed households in both qualitative study sites reported that they had experienced only minor negative impacts of COVID-related restrictions on their subsistence food production. They explained that they had been able to do their regular agricultural activities as normal as they had their own seed for sowing stored since last. In Table 3 we summarize the responses about the impact

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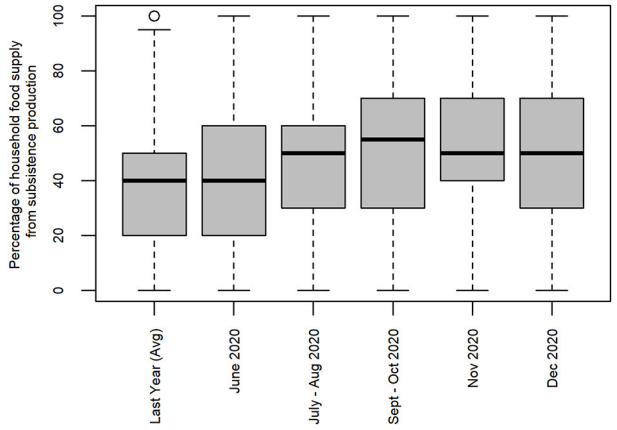

FIGURE 3
Subsistence food consumption before and during pandemic. Boxplot showing the proportion of household food derived from subsistence production compared to other sources (market and state food support). Median subsistence food consumption is very similar between the first month of our surveys (June 2020) and households' overall estimates from the preceding year. However, subsistence consumption increased in the following months (August and October) in the context of continuing disruptions, before reducing again (Nov and Dec).

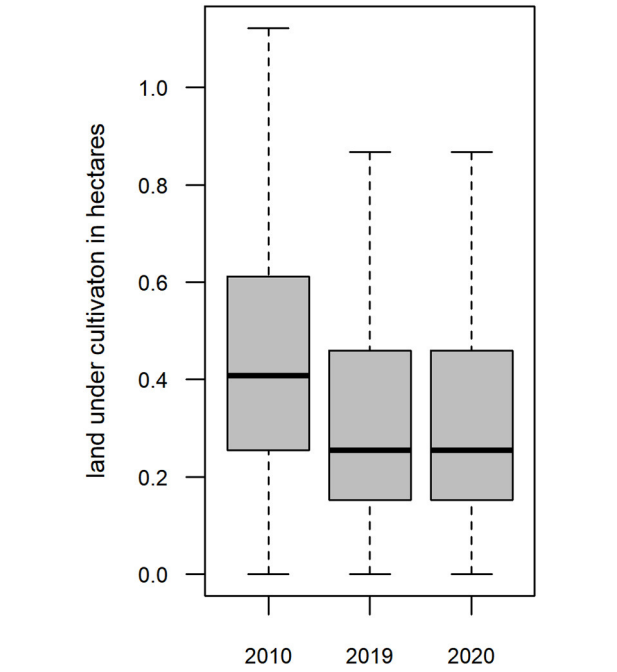

FIGURE 4
Land under cultivation. Households total land under cultivation has declined since 2010 on average (10 years before our survey) amidst growing investment in off-farm employment. Several households (20 out of 240) report small increases in productive land between 2019 and 2020, however this change is marginal and is not perceptible in the graph.

of COVID on farming derived from the qualitative data. For many households' subsistence production actually improved as a result of

TABLE 3 Effects of COVID on farming.

Case study sites	Effect on subsistence farming	Effect on cash crops (semi-commercial farm)
Chyasku ($N = 19$)	Limited impact (19 HHs)	Loss of income due to challenges accessing markets (13 HHs)
	Increase in size of production (4 HHs)	Increase in price of inputs (increased cost of production) (13 HHs)
	Increased price of inputs (19 HHs)	Reduction of size of production (5 HHs)
Khimti ($N = 9$)	No effect (9 HHs)	Loss of income due to challenge accessing markets (6 HHs)
	Increase in production (1 HHs)	Increase in price of agricultural inputs (increased cost of production) (6 HHs)
	Increased price of inputs (9 HHs)	Reduction of production (5 HHs)

reverse labor migration. For example, farmers in Chyasku reported that extra labor available in the household made farming easier, and therefore they did not need to hire labor which they would normally do. A Tamang man who grows vegetable in Chyasku said, "In my family, six members have returned from Kathmandu during the lockdown. It has [therefore] been easier to cultivate due to more hands available in the household."

These findings were also supported by our survey data, which shows that during the first wave of pandemic (2020) 37.5% (90 out of 240) households had members returned in the family (mostly from cities). In the qualitative interviews respondents reported that about half of the contributed to family farming during their stay in the village. This means there was more labor forces available for farm work than the previous year. However, it appears that such labor availability was temporary; a vast majority of returnees went back to cities after the situation was eased in early autumn.

However, when looking closer at the choices of crops grown during the pandemic, some distinct trends could be seen when comparing across different the categories of food grains (e.g., maize and paddy), pulses (e.g., kidney beans), and vegetables (a diversity of high-value cash crops) (Figures 5A, B). The data shows that the decline in total land under cultivation over the past 10 years has led to a reduction in food grains, which are grown primarily for households' food need (t-test, diff. of means $= -0.141$, $p < 0.0001$). In contrast, vegetable production, while relatively marginal in overall land holding size, has shown a significant increase in production between 2010 and 2019 (a median increase of 218.75% t-test, diff. of means $= +0.0422$, $p < 0.0001$). Vegetables are high-value crops, which have been made possible by growing market integration especially through improved road connectivity. Thus, the general trend during the last decade has been that while subsistence cultivation of grain has declined, some farmers have been able to take advantage of new marketing opportunities and have started to plant vegetables for sale.

However, this trend has slightly changed during the pandemic (Figure 5). Most significantly, we find an increase in food grain

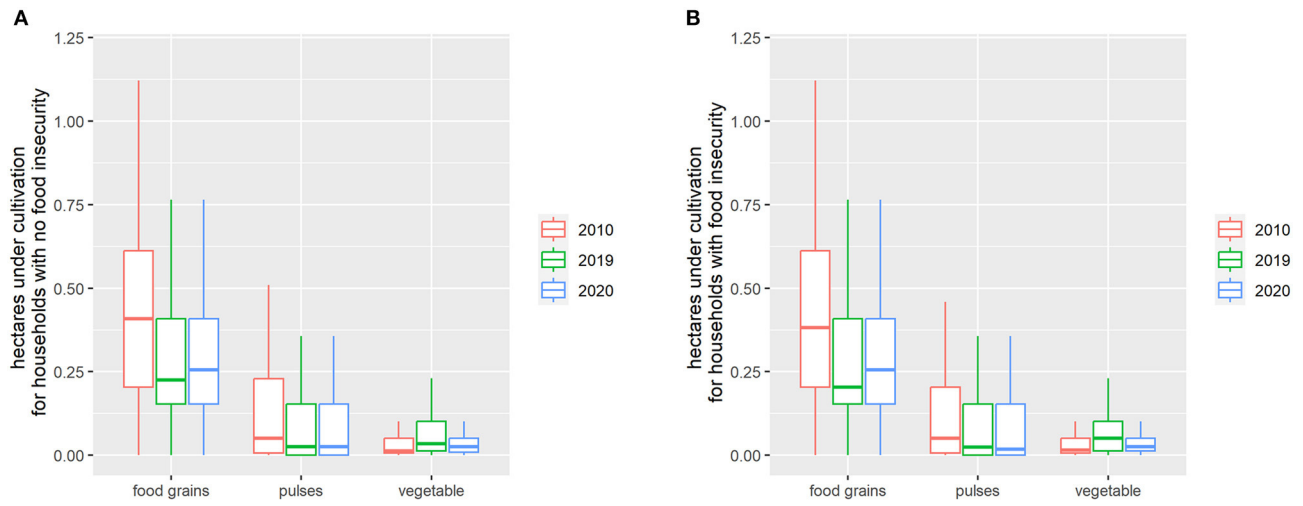

FIGURE 5
Change in land under cultivation before and during pandemic. Land under subsistence food grains decreased from 2010 (10 years before the survey) to 2019 (the year before COVID restrictions). In contrast, commercial vegetable production increased. Following the pandemic, vegetables decreased while subsistence food grain production increased marginally—including for those not experiencing food insecurity **(A)** but especially for those experiencing food insecurity **(B)**.

TABLE 4 Migration returnees' decision on future livelihood strategies.

Case study sites	Re-joining migration	Continue farming	Investment of remittance on land/farming	Cultivation of abandoned land
Chasku (19 HH)	11 HHs with people expressed plan to re-joining migration	Seven migrants shared plan to continue farming but move to commercial farming	3 HHs invested remittance on land/farming (for buying land in Tarai (1 HH), starting commercial farming (2 HHs)	3 HHs reclaimed abandoned land and 2 HHs re-engaged in farming
Khimti (9 HH)	In 7 HHs member/s expressed plan to re-join migration	Four returnees shared plan to re-engage in farming and move to commercial farming.	1 HH invested remittance on land/farming (buying irrigated land in Khimti)	No households have reclaimed abandoned land and re-engage in farming

production between 2019 and 2020. Interestingly, this increase was *only* statistically significant for households that experienced some level of food insecurity following the pandemic (either "some" or "significant" difficulty as noted above; *t*-test, diff. of means = −0.008, $p = 0.0430$) but not for other households (*t*-test, diff. of means = −0.004, $p = 0.46$). It is important to note that the increase is not of great magnitude. But it does suggest that households gravitated toward increasing subsistence food production at the margin, which may have been connected to households' situation of food insecurity during the pandemic.

Qualitative enquiry identifies a variety of challenges faced by semi-commercial farmers across our study area. For example, some farmers in Khimti involved in commercial production reported a shortage of inputs such as hybrid seeds, chemical fertilizer, pesticide, and animal feed during the first lockdown in 2020. With the shortage of inputs, the prices raised quickly. These challenges sometimes had compounding effects. For example, one pig farmer in Khimti reported that the price of pig feed increased by 30%; moreover, he could net get the pigs to market and thus had to feed them much longer than normal. This increased the cost of his production considerably.

The restriction in mobility made it hard to sell products for several semi-commercial farmers. The few who had private vehicles (e.g., motorbike) could manage to take their products to the market in a nearby town, but most semi-commercial farmers rely on public transport to bring their products to the market, and these were all canceled. Further, market areas (the *bazars*) were closed during the lockdown. In many cases, the fresh vegetables produced in the villages could not be sold, and many resorted to feeding them to livestock. A female farmer from Chyasku reported:

> I worked as usual on my farm during the lockdown. The main problem was that I could not sell [my] products in the weekly Ramechhap Bazar where I used to sell fruits, vegetables, and beans. I can store pulses, but I had to either distribute vegetables with neighbors or feed them to the cows.

Another respondent in Chasku shared:

> Ramechhap bazar was closed, and there were no transportation services during the lockdown. The use of porters would have been expensive, and the income from vegetables would not cover the transportation cost. We cooked the cabbages and gave them to pigs as feed. I was eventually able to sell about 100–200 kg of cabbage but at a very low price of 10 NRP/kg.

With such difficulties with selling products, a few of the farmers decided in the 2020 growing season (starting from June) to grow subsistence crops instead. One such example, is a farmer in Chyasku who used to cultivate vegetables and raise pigs. With the prospect of upcoming market uncertainties and increased costs for inputs due to the COVID situation, he decided to temporarily halt the vegetable cultivation and instead spent time on reclaiming a 0.2 ha field, which had been left as fallow for ten years, to use for millet production. He argued, "I lost income from vegetables and my family needs food to grow locally."

In a follow-up qualitative field visit in September 2021, we learned that the second wave of COVID-related restrictions had relatively less impacts compared to the first; neither subsistence nor commercial farming seemed to have experienced any lasting changes in Chyasku or Khimti. Overall, our findings suggest that, while the pandemic had some initial impact on farming strategies, the effects have not been great, and we have little evidence to suggest that experience of this shock will alter farming trends over the longer-term, at least overall. Nevertheless, our findings do point to the continuing importance of subsistence farming, as we shall discuss in the coming section.

5.2. Continuing importance of agriculture and future livelihood strategies

Despite the major changes in land use during the last decades, it is important to note that farming continues to be important for many smallholders. Notably, a vast majority of households (231 of 240, 96%) in our quantitative survey continue to cultivate at least some amount of land. Likewise, households estimated a median 40% of total household food grain sources are derived from their own production the year before the pandemic (2019)–an amount which increased during the early months of the pandemic lockdown. Thus, even if total land under cultivation has declined over time, agriculture does remain important for rural livelihoods–and is likely to remain important into the future.

Moreover, while we find no major long-term changes in agriculture across our data (quantitative of qualitative), qualitative interviews offer some indication that certain farmers may evaluate their overall investment in agriculture. In Khimti and Chasku, among the 28 people we interviewed that returned from abroad during or just before the pandemic, nearly 11 shared a preference to go abroad again, and that they would prefer to stay in the village and engage in the farming. Of these 11 respondents, two households had moved completely out of the village and had not been doing farming over past few decades (see Table 4). Among them, a man interviewed in Chyasku described restart farming after 20 years of living away from the village, as he explained:

> I started to plow land that had been abandoned for 8 years. (My) parents used to cultivate that land as long as they could work, then the land was left fallow. I used to work outside as a driver but decided to give up my job and I started to plow land and do traditional farming i.e., maize, beans. I have also constructed a shed for goats and pigs and will have a few of them. I want to invest in poultry and construct sheds for this. I am planning to work closely with a trader from Manthali [a bigger market town] who agreed to invest in the chickens and feed and will later buy all the products.

Farmers who expressed a desire to reinvest in their agriculture indicated that they were interested to start semi-commercial farming such as vegetable cultivation, raising cows, pigs, goats, and poultry. For example, a young man from Khimti who returned during the first lockdown period described intentions to start a semi-commercial cow farm. Another farmer in Chyasku described wanting to move into fruit production. He explained that the family thought about starting up commercial farm for quite some time and that the pandemic situation became an opportunity to start it.

An official from Likhutamakoshi Rural Municipality, in which Khimti lies, reported an increase in the number of people wanted to register new agriculture firms specializing in goat, pig, and fruit production during the pandemic. Registered firms allow farmers to claim state support such as a grant or loan with subsidized interest rate fand/or technical support from the *Palika* (municipality).

Thus, while our survey data suggests that the pandemic has not led to a large-scale return to farming, these accounts show that it has catalyzed interest to do so among some returned migrants. It also stands as testament to the continuing importance that many households place on farming and its potential, even despite widespread challenges. However, it is also important to note that these accounts were relatively few, and it remains unclear whether households will continue to pursue such efforts over the long-term.

6. Discussion

The findings of this paper showed a relatively small impact of the global COVID pandemic on farming in the mid-hills in Nepal, a finding has resonance with other studies (Adhikari et al., 2021). Overall, poorer and more marginal social groups saw greater challenges to access sufficient food during the pandemic (also see Bista et al., 2022). People with less land were particularly impacted, and this may be partly a result of limited food stores from previous production. We find that household dependence upon subsistence food sources increased in the months following the initial lockdown, which may have resulted from increasing distress as savings were exhausted. Many families were forced to borrow money, with potential longer-term negative impacts on household economic security.

Overall, subsistence food production was not negatively impacted by the lockdown, and we saw a marginal increase in land under subsistence food (grain) production among households that experienced food insecurity. However, semi-commercial farming was to some extent negatively impacted due to households' inability to access inputs and markets. In response, many farmers made temporary changes to their crops, primarily from semi-commercial production to subsistence food production. However, our data suggests that these changes were for the most part only temporary modifications. The pandemic has thus had limited effect on the overall agricultural strategy and livestock husbandry; however, we find evidence of increased interest in agricultural production among some farmers. Together, these findings underscore the continue importance of subsistence food production to secure

livelihood among rural households (Rigg, 2020; Chhetri et al., 2021; Sugden et al., 2021) as well as the potential for further growth in semi-commercial farming (also see Bista et al., 2022).

Our examination of the impact of COVID pandemic on farming and overall rural livelihoods shed some light on why it is so important for rural households to continue subsistence food production despite continued challenges as well as more remunerative off-farm livelihood options. Indeed, subsistence food production remains an important part of the safety net of food security for rural households, particularly in the times when off-farm incomes such as remittance are unpredictable or disrupted. This strategy of course has its limits, and as seen in Figure 2 those families with little farmland were more likely to suffer food insecurity during the COVID crisis.

This has important policy implications. At present, the agriculture development policy of Nepal appears to have prioritized commercialization in agriculture and state support for commercial agriculture favor larger scale farmers (Sijapati et al., 2017). For example, the 20-year Agriculture Development Strategy (2015–2035) has prioritized support for technology driven commercialization and mechanization. The agriculture ministry has initiated programs such as the Prime Minister Agriculture Modernization Project (see Gupta et al., 2021) to support the modernization policy. While the state has some programs to support smallholder farmers such as small subsidies for chemical fertilizer, agriculture extension services, and distribution of improved variety seeds, a major proportion of support has been on promotion of larger scale commercial farmers.

Our work indicates that there is indeed an interest in commercialization. Yet, this emphasis fails to acknowledge the continued importance of subsistence production in sustaining rural livelihoods. Our work shows the importance of developing agriculture policy that explicitly recognizes and supports subsistence food production in addition to commercial agriculture. Yet, policies targeting subsistence food production will not benefit those who have limited access to land. Thus, agriculture policy should also consider interventions toward enable the access to land for people who are landless or have very small land holdings. For, example some reports (see Gupta et al., 2022) suggest the schemes such as land pooling and collective/cooperative farming could be a way forward.

Despite the importance of subsistence farming for rural households' daily needs and a growing interest on semi-commercial farming, it nevertheless appears farming alone is not sufficient (or profitable) to secure livelihoods of most of the rural households. As a result, most of rural households are forced to explore some form of off-farm employment, either domestically or internationally. Studies show that both domestic wage labor opportunities and international labor migration are associated with numerous risks and uncertainties (Rigg et al., 2016; Sunam, 2020; Sugden et al., 2021), while remittances alone often do not generate sufficiently stable nor enough incomes to sustain a family and improve overall wellbeing (Sugden et al., 2021). This is why it is important for the rural households continue to engage in farming often in combination with off-farm employment (see McCarthy, 2020; Rigg, 2020; Sugden et al., 2021).

During the initial months of the pandemic, some reports (Sunam et al., 2021b) anticipated that large-scale reverse migration may lead people to go back to farm and that this would lead to a reinvigoration of agriculture production. However, as findings from this and other studies have shown (see Gupta et al., 2022), this did not happen. In hindsight, this is not surprising given the fact that the rural agriculture is facing a mix of structural challenges including declining farm sizes (Marquardt et al., 2016), lack of farm labor, low profitability, and climate change impacts (Bardsley and Hugo, 2010; Gentle et al., 2014). In recent years rural farmers has also suffered from increasing harvest losses of crop and livestock by wildlife (Bista and Song, 2021; Andersson and Hansson, 2022). These challenges threaten the safety net function of subsistence farming and suggest that off-farm employment will continue into the future. This is precisely why it is so important for state policy to explicitly target small holder farmers' needs. Taking these challenges seriously are critical to safeguard basic wellbeing and to contribute to maintaining rural areas as dynamic places of agriculture and economic vitality.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by Swedish Ethics Board: Dnr 2020-00944, The University of Minnesota IRB: STUDY00008495, and Indian School of Business IRB: ISB-IRB 2021-04. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

Author contributions

DK played lead role on conceptual development, methodology development, supervision of qualitative data collection, led qualitative data analysis, and writing manuscript. KM: contribution to conceptualization and methodology development, support on qualitative data analysis, and significant contribution on writing manuscript. HF: contribution to development of conceptual idea and framework, take lead on developing and conducting quantitative survey, overseeing quantitative data analysis, and significant contribution on writing manuscript. SK played main role on qualitative data collection (field work), provided support on qualitative data analysis, and writing manuscript. DS carried out quantitative data analysis and provided inputs on writing. DP: contribution on methodology development, support on field data collection, and contribution on data analysis and writing. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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