

Article

Reviving Smallholder Hill Farming by Involving Rural Youth in Food System Transformation and Promoting Community-Based Agri-Ecotourism: A Case of Uttarakhand State in North-Western India

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Abstract: Until recent decades, labour-intensive subsistence farming was a way of life and livelihood in the hill communities of Uttarakhand, India. However, the nature of agriculture falls far short of the expectations of the main labour force, the rural youth, leading to their mass migration to non-agricultural occupations. The large-scale youth migration has left many hill farming landscapes depopulated and farmlands abandoned. As youth have special stakes in food systems, they must be included in the sustainable transformation of food systems. By doing so, the migration-prone hill region may be transformed into a place where rural youth have more options for work and income. Therefore, the agriculture sector needs to change and develop into a more engaging and youthful workplace. There are opportunities to explore and barriers to be removed. Besides identifying priority research areas on local food systems, in this exploratory research, we investigate opportunities to involve rural young people in the transformation of the food system. We document information by conducting focus group discussion (FGD) meetings in about 100 villages in the Uttarakhand hills, representing all major farming landscapes. This study mainly focuses on improving the production and consumption aspects of local food, which not only benefits the health and wellbeing of local communities but also has many positive economic, social, and environmental effects. In addition, we explore opportunities for reviving mountain agriculture through agri-ecotourism, which is a symbiotic relationship between tourism and agriculture. Making home- or farm stays in agri-ecotourism a subsistence strategy for local youth will contribute to a more prosperous rural economy. Recognising Uttarakhand's rich culture and heritage while exploring the culinary travel opportunities in homestays will provide opportunities to focus more on traditional food systems, exposing various tangible and intangible aspects of the host region's food culture to tourists. The findings of this study will aid in identifying specific policy issues for consideration by planners and policymakers at the local and state levels. Additionally, this exploratory study will assist young, motivated researchers in conducting follow-up, in-depth investigations and producing empirical data in their specialised fields.

Keywords: mountain agriculture; rural youth migration; food system transformation; agri-ecotourism; culinary homestay tourism



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1. Introduction

Agriculture is the backbone of the economy of many countries. Besides the production of essential food crops, it can also include all other related sectors such as forestry, agroforestry, animal husbandry, horticulture, beekeeping, etc. In addition to providing food, nutrition, and raw materials, agriculture also provides employment opportunities to a very large percentage of the world's population. According to the Food and Agriculture

Organisation of the United Nations (FAO), more than 60 percent of the world's population depends on agriculture for survival [1]. Agriculture is the main source of national income for most developing countries, although it contributes a smaller percentage in developed countries.

A global review of agricultural census data found that family farms constitute over 98% of all farms on 53% of agricultural land [2], playing a critical role in global food production. India is primarily an agricultural country, and more than 70% of its rural households are highly dependent on agriculture and its allied sectors for their livelihood. In India, 47.3% of arable land is used by 87.2% of smallholder farmers. Its more than 126 million smallholder farmers, with an average holding of 0.6 ha, collectively possess around 74.4 million ha of land [3].

Uttarakhand state, in the north-western part of India, is primarily a hill state. Of its total area of about 5.35 million ha, 86% is mountainous and supports about 50% of the state population [4]. Most of the northern part of the state, adjoining Tibet, is covered by high Himalayan peaks and glaciers. Agriculture is one of the most important sectors of the Uttarakhand economy, as it is in the rest of India.

As a large area of the Uttarakhand hills is under small and marginal holdings, scale economies cannot operate, and so the labour-intensive input cost per unit of output is high. The soil of the tarai (plain) region, however, is very fertile and supports a number of crops, but indiscriminate use of chemicals and over-exploitation of groundwater make the soil of this region increasingly less fertile, causing a reduction in the sustainability of its production. On the other hand, the hill region is prone to constant soil erosion due to steep slopes, making it less and less fertile, which requires the adoption of better management practices.

Except for the plains and some river valleys in the hills, where irrigation is available, most agriculture in the state is rainfed. Plains and hill agriculture are thus very different. The productivity-oriented Green Revolution has highly benefited the farming system of the plains area, while it has had a limited impact on the hilly region, where mainly traditional subsistence agriculture is still practised, thereby presenting farming in the hills with a good opportunity to diversify and adopt organic practices.

Three distinct agro-geo-climatic zones (Figure 1) can be found in the Uttarakhand hills, together with abundant natural resources, including several rare medicinal, aromatic, and herb plants and many wild economic species used in agricultural systems [5]. The vast water resources available are also favourable for hydropower. Tourism is another important sector.

Traditional hill agriculture is a subsistence-oriented, closed-loop, and diverse production system with limited market integration. Such a farming system recycles nutrients and organic matter on-farm, with additional nutrients supplemented from nearby rangelands as leaf litter, fodder, and bedding materials for livestock. Agroecological farming practices are largely practised including diversification, mixed farming, intercropping, cultivar mixtures, habitat management strategies for crop-associated biodiversity, biological pest control, improved soil structure and health, biological nitrogen fixation, and recycling of nutrients, energy, and waste.

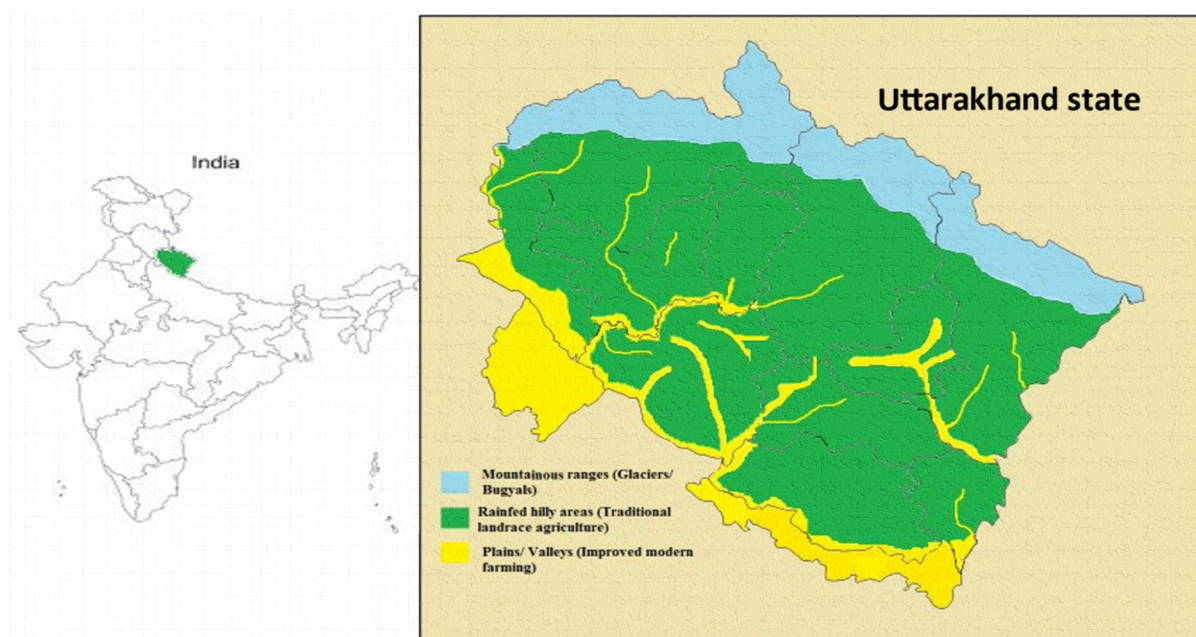


Figure 1. Map of Uttarakhand state depicting the three representative agroecosystems.

Agriculture has traditionally been the backbone of the rural economy and a way of life and livelihood for native communities, although farm households have varying levels of reliance on off-farm income. However, there has been widespread desertion of hill farming in many regions in recent years, which raises questions about the sustainability of hill farming. The long-term viability of the labour-intensive farming system is particularly challenged by the growing exodus of young people looking for jobs off-farm in cities. However, our prior study [6,7] revealed the enormous potential of organic farming when combined with regional marketing prospects. These include community-supported agriculture, integrating agriculture into school meal programmes, and developing local agriculture product value chains for localised marketing. These initiatives may help rural youth find employment opportunities at the local level, preventing their exodus to urban centres in the plains in search of off-farm jobs.

In our recent exploratory studies, we studied the sustainability aspects of traditional hill farming and reported the following important lessons [7,8]: traditional hill farming is polyculture farming; crop diversity and within-species diversity have been a necessity rather than a choice, with farming communities conserving enough landrace diversity in production landscapes; forestry and agroforestry are interconnected elements with cropland; livestock are integral to crop husbandry; traditional crops are nutritionally rich and mostly considered functional food; and a food-based approach to community nutrition and health is an accepted practice. Traditionally, rural communities were self-sufficient in terms of food and nutrition. There has been very little marketable surplus and this has been traded locally, primarily through barter exchange. Some cash crops, mostly fruits and vegetables, are marketed locally. Livestock has been the main source of cash income through the sale of meat, milk, and milk products locally. The traditional small-scale crop–livestock mixed farming practices, however, gradually disintegrated over time because of poor management of common property resources (CPR). CPR surrounding farmlands were traditionally used for the grazing of livestock, the harvesting of wild economic species for use in agricultural systems, and several other purposes including fodder, firewood, etc.

Despite the necessity for a sustainable agricultural labour force, many young people in rural areas around the world are frequently unemployed or underemployed [9]. Unless they find significant economic opportunities and desirable settings in rural areas, many people will continue to migrate to urban areas since they do not view agriculture as a lucrative or respectable vocation. Investing in youngsters living in rural areas is, therefore,

key to enhancing agricultural productivity, boosting rural economies, and ensuring food security [10]. Furthermore, the large-scale migration of rural youth to urban centres contributes to the emerging phenomenon of overcrowding and growing unemployment in urban areas.

Recognising the agricultural sector's potential to serve as a source of livelihood opportunities for rural youth, challenges and opportunities with respect to increasing their participation in the sector have been assessed [9]. The six major challenges to securing youth involvement in agriculture apply to the majority of traditional smallholder production landscapes and are as follows: (i) insufficient access to knowledge, information, and education; (ii) limited access to land; (iii) inadequate access to financial services; (iv) difficulties accessing green jobs; (v) limited access to markets; and (vi) youth's limited involvement in policy dialogue. Eliminating/breaking down these barriers is a crucial step, among others, in supporting youth participation in increasing the production of and access to healthy, nutritious food.

Globally, youth are calling for three major changes to food systems [11,12]: (i) ensuring that youth are involved in the essential overhaul and widespread transformation of food systems to increase access to safe and nutritious food; (ii) the transformation must focus on improving food system resilience; and (iii) the transformation must drive healthier and more sustainable production and consumption. Building resilience to address vulnerabilities is vital to securing a healthy food system. There is a need for large-scale transitions to nature-positive production practices [13]. The idea that the right to adequate food is a universal human right means we need robust, multi-stakeholder efforts to respond to political and environmental crises. Poor and unhealthy diets and the resulting malnutrition are major drivers of non-communicable diseases around the world [14]. All generations, therefore, need access to knowledge and products to make healthier, climate-positive dietary choices. Government policy needs to restrict inappropriate marketing of unhealthy, over-processed foods targeted at youth and provide nutritious and sustainable meals in schools and universities, both for nutrition and awareness.

Recent events, including the COVID-19 pandemic and the ongoing Russia–Ukraine conflict, have exposed significant flaws in global economic, social, and political structures, and crises related to food distribution, economics, health, and the climate [15,16], teaching us significant lessons about the critical need for food system resilience [17].

Young people, representing 16% of the global population [18], have been among the hardest hit by the COVID-19 pandemic, with the impacts severely affecting education, job opportunities, nutrition, and health. South Asia has the largest young labour force in the world, with close to 100,000 young people entering the labour market every day. According to IFPRI [19], 72% of young people from the region are likely to be unemployed in the aftermath of the pandemic. In countries such as India, Nepal, and Bangladesh, with a significantly larger young population, labour force impacts are predicted to be even greater, as young people are three times more likely to be unemployed than adults [20]. According to the UNICEF Global Development Commons [21] report about global youth unemployment, 621 million young people aged 15–24 are not in education, employment, or training (NEET); almost 90% of all young people live in developing countries and it is estimated that 23% of young people currently employed in the world earn less than USD 1.25 a day.

Young people have a vital role to play in this and have the power to hold policymakers, food producers, and businesses accountable through mobilisation and demonstrations. Healthy and sustainable food systems are urgently needed in this critical scenario. Education, empowerment, innovation, and entrepreneurial solutions are the four main areas where young people can get involved in changing the current food system [10].

In India, young people and women were disproportionately more likely than other workers to lose their jobs during the COVID-19 pandemic. Almost 60% of workers aged 15 to 24 have lost their jobs during or after the lockdown. At the same time, agriculture was one sector with the least volatility in India during the pandemic, absorbing 42% of construction

workers and 40% of health and education workers who lost their jobs elsewhere early in the pandemic [22,23].

As the Uttarakhand hills are primarily an agriculture-based society with a rich native food culture and traditions, there is a huge possibility of gainfully engaging rural youth in food system transformation. A paradigm change from agriculture that maximises productivity at the expense of the environment to agriculture that promotes biodiversity is required to accomplish nature-positive large-scale production. This necessary change goes well beyond earlier policy discussions and research; it takes the difficulties young people confront in starting farms and realising a sustainable agricultural future seriously, and considers if young people have the space they need for this future.

Youth may play a hugely important role in agriculture by increasing food production, changing regional food systems, and building economies that help lift entire communities out of poverty [9,11]. Two out of three young people outside of urban areas in developing nations live where there is the most agroecological potential, and expanding the agricultural sector has been shown to increase the incomes of poor families two to four times more effectively than other industries [24].

There is need to revive traditional hill farming and address the livelihood security of migration-prone rural youth by enhancing employability in the traditional farming and food sector. Enhancing production and consumption of local food by engaging rural youth in hill farming, promoting community-based agri-ecotourism, and making homestays a livelihood strategy are considered important interventions in this direction.

Ecotourism is well developed in the Uttarakhand hills and, around ecotourism sites, homestays are becoming increasingly popular among urban visitors [25]. The 'dedicated' and 'hardcore' nature-based tourists [26] are primarily interested in local cuisine; however, these foods are frequently not offered to tourists during homestays. In addition to rice and dal, which are easy and quick to cook, guests are frequently provided with quick food options that are generally accessible, such as instant noodles. Local traditional cuisines are also not offered in restaurants in cities despite being in high demand.

Rural youth employment in ecotourism is currently limited. Agri-ecotourism, or tourism around farmlands, is a growing activity that has the potential to increase in situ employment for rural youth and could boost the revival of hill agriculture and its future sustainability [27]. Near the numerous well-known ecotourism destinations and natural areas in the state of Uttarakhand, there are a number of farming landscapes that can be developed as agri-ecotourism destinations, where homestay tourism may turn into a means of livelihood. In order to promote religious tourism and preserve the cultural heritage of the locals, agri-ecotourism destinations may also be built around specific well-known temples frequented by devotees. Community-based agri-ecotourism could support the economic sustainability of traditional farming landscapes, improve the environment and aesthetics of the target region, and strengthen connections between the region's residents' cultural heritage and wellbeing and local agriculture and food systems.

Agri-ecotourism can benefit rural youth by creating jobs, improving local food supply chains, encouraging the emergence of new businesses, and improving community services and infrastructure. Innovative links between ecotourism and agriculture promote sustainable traditional agricultural practices and provide mutually beneficial economic opportunities. However, the potential benefits of agri-ecotourism will only be realised if it is well coordinated and managed.

In this exploratory study, we systematically identify the priority research areas to be addressed regarding local food systems: the local food system challenges; increased urbanisation in the Uttarakhand hills and food insecurity among migrant youth and other urban poor; rural youth engagement in farming and food system transformation; and youth engagement in subsidised food availability for better nutrition in community canteens, schools, universities, hospitals, restaurants and so on. We also investigate the potential for boosting community-based agri-ecotourism and homestays as part of hill

community livelihood strategies. In addition, the possibility of establishing some model agri-ecotourism sites in the highlands of Uttarakhand will also be explored.

In the present research, we specifically explore the potential of smallholder traditional hill farming and gainfully employing rural youth in farming and food system transformation. We primarily investigate how best rural youth can be engaged in nature-positive regenerative production practises and be economically compensated for the ecosystem services they generate (PES). An enhanced emphasis on sustainable and inclusive food system education will be placed on preparing young people for food-related engagement and careers. The educators must address complex issues of ecological sustainability, food safety and security, food sovereignty, and emerging changes to food systems such as digitization, in addition to entrepreneurship, profitability, and livelihoods, rather than education that often follows linear cause-and-effect models focusing on a limited range of objectives.

2. Materials and Methods

The present exploratory research was undertaken in the hilly areas of Uttarakhand state, which comprise about 85% of the state's geographical area and support about half of its population. All of the region's representative farming landscapes (Figure 2) were visited, and information from approximately 100 hill villages was documented. Half of the total villages surveyed belonged to mid-hill areas where crop–livestock mixed farming is practised and comprises about 70% of the arable land under rainfed hill farming (Figure 2A). About 25 villages each were surveyed from the other two representative landscapes: higher elevation mountainous areas adjoining Tibet with nomadic pastoralism (Figure 2B) and the river valleys where improved agriculture is practised under assured irrigation (Figure 2C). Villages where at least 50% of the households were engaged in agricultural activities were selected for the study. The number of households per village ranged from 50 to 400.

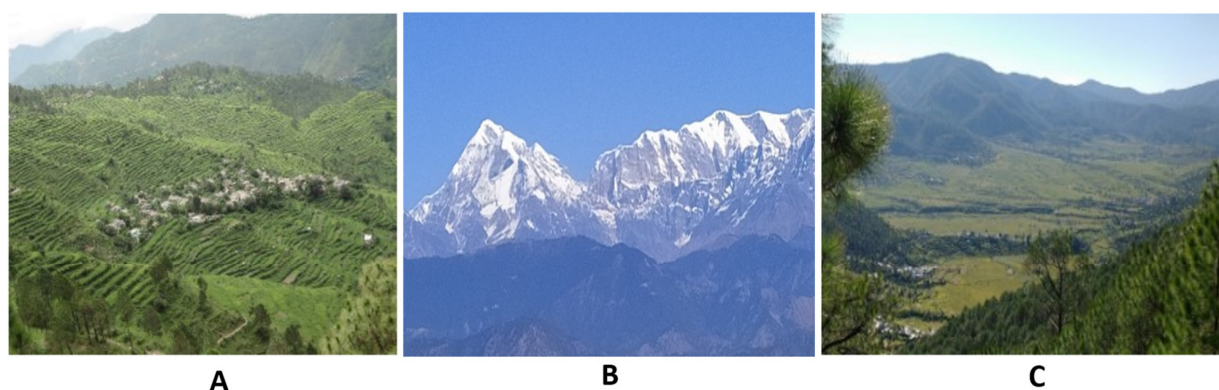


Figure 2. Representative hill farming landscapes: (A) mid-hill crop–livestock mixed farming landscape, (B) high mountainous regions adjoining Tibet, and (C) river valleys.

Focus group discussion (FGD) meetings were conducted in each of the 100 villages, and information was documented on aspects of local agri-food system dynamics and the level of food insecurity; rural youth migration; food system challenges and possibilities of engaging rural youth in food system transformation; and aspects of community-based agri-ecotourism and homestay-based culinary tourism for enhanced rural youth employability and livelihood subsistence. Each discussion meeting involved 8–10 household participants. The group included both knowledgeable elderly farmers and young people, both men and women. On average, one whole day was spent in a village interacting with the most willing respondents that comprised the group.

In each village, some youth-specific information was additionally documented from 8–10 young graduates (a person who has completed undergraduate study or their first academic degree), both men and women, including their aspirations for future professions, the reasons (from a pre-selected list) for growing disinterest among youth in farming, and the frequency of fast food consumption.

The prevalence of malnutrition among rural youth was also assessed based on the researcher's personal observations and expertise, which were further authenticated by community-based basic health workers and other local-level secondary sources.

Informal interaction meetings were separately held with visitors at various ecotourism and nature sites and a few famous temples/temple complexes of architectural and cultural significance. We casually interacted with visitors based on informal social relationships established in settings such as restaurants, homestays, guesthouses, and hotels. Tourists' expressed interests were duly considered while exploring the possibilities of developing some agri-ecotourism sites as models. Possibilities of exploiting culinary travel opportunities in hill tourism were explored through personal interviews with the visitors with the aim of increasing the involvement of the rural youth in the transformation of the food system and the possibilities of the revival of hill agriculture.

Informal interactions, especially with foreign visitors and interested domestic guests, were held to organize cooking classes in host families and explore the possible creolization of food items to enrich and diversify the local food culture.

As the research design of the present study was based on an exploratory survey, it was not really possible to statistically analyse the data elicited through FGD meetings and the interviewees' subjective judgments. For quantitative data recorded as a percentage, the original values without transformation and the normality test are presented.

The representative villages of all hill farming landscapes were visited at least twice over a two-year period in 2021–22, to conduct any gap filling or obtain additional information.

3. Results

3.1. Identifying Priority Research Areas on Local Food Systems

Based on FGD surveys, the priority research areas on local food systems were identified, including household food self-reliance, the marketing potential of local foods, and policy issues relating to local foods (Table 1).

Table 1. Priority research areas to be addressed in local food systems.

A. Rural Communities' Food Self-Reliance in Uttarakhand Hills
Household production and consumption of native food resources to determine the farming community's past and present food self-reliance.
Identification of a source of more food or nutrients for the communities if food self-reliance declines.
Identification of the reasons for the decline in local production of traditional food resources.
Comparison of the total nutrient production with the total nutrient requirement of the community.
B. Marketing potential of local food
Local agricultural markets for farmer households in the region.
Consumer demand exists for locally grown foods.
The potential of localised marketing.
Components of successful marketing strategies.
Encourage the government food programme to purchase locally grown foods.
Added-value interventions make local food increasingly popular among urban consumers.
Create harmonious urban–rural linkages around the food system.
C. Local food policy planning
Linking production and distribution aspects of the local food economy helps to coordinate the ways in which community residents have access to quality, healthy, and nutritious food and create new linkages with area farmers, particularly those committed to sustainable production.
Develop policies that protect prime farmland, preserve biodiversity, and encourage farmers, youth, local processors, or food-related entrepreneurship.
Make regional food systems a more tangible reality for citizens and invite democratic participation.
Promote a food-based approach to community nutrition and health.

The historical perspective of agricultural production in the Himalayan region revealed that, in the past, rural communities in most traditional production landscapes were largely food self-reliant, but this trend changed over time and a large proportion of the rural population is now food insecure. Among the primary reasons for the decline in local food production are: (i) smaller and highly fragmented landholdings; (ii) large-scale migration of rural youth, the major labour force, to urban areas in search of off-farm jobs; (iii) large-scale abandonment of hill farming (about 30% of arable land is abandoned in rainfed mid- and high hills); and (iv) a lack of formal education. This information helps identify the potential

for creating more agricultural diversification and can point to ways for re-introducing local production, processing, and value-added activities. In the absence of food self-reliance, rural communities are forced to buy food from the open market or rely to a great extent on state-sponsored transfers from public programmes (food subsidies and food aid), such as, for example, free food supplies delivered during the COVID-19 pandemic to households below the poverty line.

It was observed that local markets are not well developed for native agricultural produce. Furthermore, farming is traditionally subsistence in nature, with limited marketable surplus, particularly for the staple food crops. Marketing studies can be helpful in understanding food distribution dynamics, barriers, and opportunities within a specific region. They provide specific, reliable information about the needs of local producers and consumers and how they might be linked within their regions.

Table 2 presents the status of subsistence production and rural food security in the Uttarakhand hills. We document that, presently, about 60% of rural hill farming communities are food insecure. Increasing and stabilising local food production is, therefore, essential for food security. The majority of farmer households in rural areas are poor and become more food insecure when local food production declines. Agriculture will, therefore, play a key role in alleviating poverty.

Table 2. Subsistence production and rural food security in the Uttarakhand hills.

Food Security Indicators	State of Food Security
Current status of household access to staple food	<ul style="list-style-type: none"> - Food self-reliant (subsistence production): 40% of households - Buying food from the market: 30% - Transfers from public programmes (food subsidies and food aid): 30%
Source of per household cash income (average INR 150,000 or USD ~2000 per annum)	<ul style="list-style-type: none"> - Farm income (crops and livestock): 40% - Non-farm (wage employment, self-employment, and remittances): 60%
Marketable surplus/deficit over time	<ul style="list-style-type: none"> - Average household deficit of about 30% for staple crops over the last two decades

Sample size: 1000 households from about 100 villages.

3.2. Migration of Rural Youth for Off-Farm Jobs and Abandonment of Hill Farming

Young people (15–24 years) constitute about 25 to 30% of the hill population. The status of the migration of rural youth for off-farm jobs and employment is shown in Table 3.

Table 3. Migration of rural youth (aged 15–24 years) and status of youth employment.

<ul style="list-style-type: none"> ● Migration of rural youth for education and off-farm jobs * 	
Households with seasonal migration of youth:	70% (within the state: 63%; out of state: 35%; and international: 1–2%)
Households with permanent migration of youth:	30% (within the state: 32%; out of state: 66%; and international: 1–2%)
<ul style="list-style-type: none"> ● Rural youth engagement in education and employment* 	
Pursuing higher education and professional courses:	15% (men: 60%; women: 40%)
Engaged in agriculture:	5% (men: 30%; women: 70%)
Informal off-farm employment (unorganized sector):	55% (men: 65%; women: 35%)
Skilled and white-collar jobs:	5% (men: 60%; women: 40%)
Not in employment, education, and training (NEET):	20% (men: 30%; women: 70%)

* Sample size: 1000 households from about 100 villages; international migration is mainly driven by a search for hospitality-related jobs.

Seasonal migrants have their principal dwellings in the villages, where their elderly family members practise subsistence farming. Permanent migrants leave their villages and migrate to other parts of the state or country, leaving their settlements and farmlands

abandoned. Migration is more prevalent in areas where farming is mainly reliant on rainfed agriculture, as farm households have limited economic incentives from agriculture due to poor crop productivity and poor access to local markets. Seasonal migration is an individual choice of the youth for better employment opportunities off-farm in urban centres, mostly in unorganised sectors, whereas permanent migration is a family choice for better education, health and skilled jobs. The push factors for youth migration are poverty, recurrent droughts, lack of full-time employment at the community level, and poor services (education and health), among others. The pull factors are better employment opportunities, more wealth, and better education and health. Farm households with youth permanently migrating have better economic resources and a better network of formal family employment compared with those households with seasonally migrant youth.

In hill farming in Uttarakhand, the speed and patterns of structural change and agricultural transformation differ across regions. In order to persist, food and agriculture systems should become more economically rewarding and environmentally and socio-economically sustainable. We observed that about 30% of farmer households, particularly from mid- and higher-elevation areas, have exited the agriculture sector entirely and are finding off-farm jobs elsewhere. Farmer households that continue to work in agriculture, particularly those in river valleys and at lower elevations, are gradually diversifying their sources of income. These farmers are gradually shifting from multiple crops to monoculture and moving away from traditional staples such as millets, local pulses, etc., towards higher-value cash crops, mainly vegetables. Inputs previously produced on-farm and most food items for the farmer's family are increasingly bought from markets or procured through transfers from public programmes (food subsidies or food aid).

As land consolidation is not possible in hill farming, average farm sizes have become smaller and smaller through fragmentation and young people's unwillingness to remain in the sector has led to increases in the average age of farmers. Male out-migration is also the primary driver of women's growing role in hill agriculture, as most migrants from rural areas are young men.

Male out-migration from the Uttarakhand hills was in the past linked with high remittances that helped boost agricultural production and women's empowerment, opening up new possibilities for women and youth in terms of livelihoods and a better rural economy. However, in recent times, migration has not been so successful, as urban areas are not well equipped to absorb the migrant population. When remittances are inadequate, women face heavier workloads, financial difficulties, and reduced welfare. Furthermore, educated young females are disinterested in traditional hill farming, adding to the NEET youth population.

Uttarakhand is one of the fastest urbanising states in India. In our exploratory survey of about 100 hill villages in the state, we observed that more than 55% of the rural youth population has migrated to urban areas, mainly for off-farm informal employment. Of the 15% of the rural youth population pursuing higher education, most of them also migrate to nearby urban centres.

In addition, we observed that population growth is outpacing new job creation and rapid urbanisation has not been accompanied by commensurate growth in non-agricultural work in urban centres, leading to unemployment and insecurity—problems that could be alleviated if agriculture and agriculture-related services were able to absorb a large share of rural youth.

3.3. Engaging Rural Youth in Food System Transformation

It is evident that the Uttarakhand hills have a large youth population, but young people tend to be more likely to migrate to urban areas than to move into agriculture. Youth aged 15–24 years represent the most active and energetic age group and, more importantly, they consume more than any other cohort.

The challenges and opportunities of engaging rural youth in local farming and food systems are listed in Table 4.

Table 4. Challenges and opportunities of engaging rural youth in local farming and food systems.

Challenges	Opportunities
<p>Poor and inadequate education about entrepreneurship development in traditional farming, food and nutrition, and rural development in general.</p> <p>Limited access to land, highly fragmented arable land and hill agriculture that is mainly rainfed, resulting in poor crop productivity; consequently, there is a limited marketable surplus.</p> <p>Inadequate access to financial services or credit.</p> <p>Lack of year-round employment at the community level for sustainable livelihoods.</p> <p>Poor market for local food resources.</p> <p>Lack of political will and policy support and limited involvement of youth in policy dialogues.</p>	<p>Numerous opportunities to promote access and knowledge to make healthier, more environment- and climate-friendly dietary choices; incorporating food education into primary school curricula.</p> <p>Increasing marketable surpluses by pooling farmland for collective organic farming through farmer cooperatives; farmer cooperatives will also have better access to financial resources and organic farming credits.</p> <p>Making native dishes popular among locals and urban consumers through subsidised food served in community canteens, schools, universities, hospitals, urban restaurants, and so on, will result in greater employment in the food system and will also help revive native farming in the context of increased production and consumption.</p> <p>Promotion of agri-ecotourism initiatives; traditional cuisines will generate sufficient jobs in the food system while promoting farmstays and homestays.</p> <p>Possibility of strong political will and policy support for employing rural youth in food system transformation; also, involving local youth in the policy planning process so that their voices are heard.</p>

In Uttarakhand's hills, traditionally, women are the primary food crop producers while men are more involved in animal husbandry or work off the farm. Women are also often responsible for the care of children, the sick, and the elderly, and know what food is most needed by the family. There is, therefore, an urgent need to promote inclusiveness in the production of food to make the food system sustainable and reduce the nutrition inequity gap, so that everyone can easily access healthy and nutritious food. We have found that if food systems are not gender inclusive, this has a negative impact on food production, food preparation, and nutrition, especially for children.

Agriculture has traditionally remained the dominant sector for youth employment. However, it is marked by informal, vulnerable, and low-productivity labour. The majority of rural youth do not find the agri-food sector attractive now or in the future and working the land has become highly unpopular: it is associated with hard physical work, low wages, uncertainty, and uncleanliness. Young people prefer white-collar jobs in the cities and projections of future urbanisation rates illustrate this. The agricultural sector, therefore, has to transform and become a more youth-friendly and stimulating environment. There are opportunities to explore and barriers to be removed.

Access to knowledge, information, and education can improve the skills of youth along the value chain. It can motivate youth to take the lead in innovation. It also helps to make connections and improve the access of youth and it can be used by organisations to promote the agricultural sector as a profitable venture, thus attracting youth.

Sustainable farming practises, such as organic farming, are particularly important in the context of the Uttarakhand hills: organic farming tends to be more labour intensive compared with conventional farming and has the potential to generate higher social and economic returns. New skills are required to make the existing jobs more ecological or sustainable.

There are many ways governments can engage young people—whether by making agriculture more appealing through new technologies or making the system more financially rewarding. Our study noted that hill societies often value agricultural work less than corporate professions. In a survey of aspirations for future professions of youth in school, only 7% plan to pursue agriculture (Table 5). Teachers, the armed forces, the hospitality industry, the police force, and business are among the top professions that rural youth wish to pursue. This is a significant barrier to involving the younger generations in building more inclusive and resilient food systems, and needs to be addressed.

Table 5. Rural school-going youth aspirations for future professions.

Career Aspiration	Mean Percentage
Teacher	22
Armed forces	18
Hospitality industry	15
Police force	12
Business	10
Agriculture	7
Others	16

Sample size of about 500 rural school-going youth.

Table 6 summarises the main reasons for rural youth's growing disinterest in hill farming, with poor economic returns and year-round employment being the principal reasons.

Table 6. Reasons for growing disinterest of youth in farming.

Reasons	Frequency (%)
Lack of economic incentives and poorly developed market for local produce	24
Lack of year-round employment at community level	22
Smaller and highly fragmented landholdings	14
Climatic stresses and uncertain weather conditions	12
Lack of role models in traditional farming systems	10
Poor education about global food system challenges and the role of youth in food system transformation	10
Poor financial/credit facilities	8

Sample size of about 500 rural graduate youth.

Understanding the effects of urbanisation on food systems, and thus on rural youth livelihoods, is critical to addressing four major food system challenges:

- Meeting the growing food demand: With rising urbanisation in the Uttarakhand hills, we observed that food demand will rise two to four times faster in urban areas than in rural areas, depending on the region and the commodity. Food insecurity will also be more prevalent in rural areas with the increased abandonment of farming landscapes, the switching of farm households to cash crops, and the decreased production of native food staples.
- Ensuring healthy and nutritious diets for all: Food-related non-communicable diseases, as well as youth malnutrition, have increased in recent years in both rural and urban areas (Table 7). Furthermore, obesity and being overweight due to the rising consumption of certain types of unhealthy foods are growing concerns. These conditions are more common in cities, but they are also on the rise in rural areas.

Table 7. Prevalence (%) of different forms of malnutrition among youth in the Uttarakhand hills.

Type of Malnutrition	Male		Female		Remarks
	Rural	Urban	Rural	Urban	
Abnormally thin	12	20	14	22	The prevalence of malnutrition varies across different production landscapes; the incidence is low where we observed high household production and dietary diversity.
Anaemic	5	10	7	14	
Overweight	4	8	3	11	
Obese	2	6	2	4	

Sample size of about 1000 youth in the age group 15–24 years from rural farming and nearby urban areas of Uttarakhand hills.

- Producing food sustainably: Climate change leading to water stress, and soil degradation due to the use of inorganic fertilizers in cash crops, increasingly hinder agricultural

productivity. Addressing the impact of climate change on the sustainability of agriculture and food production is, therefore, a major concern.

- Increasing rural incomes and employment: Widespread abandonment of agricultural land may lead to low production and a lack of youth employment at the community level. Crop diversification and local off-farm employment can help boost livelihood resilience.

3.4. Protecting the Original Culinary Heritage of the Uttarakhand Hills and Promoting the Philosophy of ‘Slow Food’ for the Wellbeing of Rural Youth

A rich heritage of ‘superfoods’ has been consumed for many years by hill communities to keep them healthy and prevent diseases, particularly food-related, non-communicable diseases. Most of the hill crops are considered functional foods and food is well ingrained in hill community traditions as a means of preventing chronic ailments and as medicine. However, many young people are unaware of the fundamental principles of the world’s most ancient and effective gastronomical science, Ayurveda, which govern their diet. Traditional hill food is tailor-made to suit our *doshas* (or our mind and body state)—*Vata*, *Kapha*, and *Pitta*—based on traditional knowledge that is relevant even after centuries. Awareness about the benefits of traditional local foods needs to be spread widely.

Before the advent of globalization, native communities consumed what was available locally and seasonally. However, fast food is now becoming increasingly popular among younger generations, even in rural hill communities, which is negatively impacting their health. Table 8 presents the statistics of fast food consumption by the young people of Uttarakhand.

Table 8. Fast food consumption among youth in Uttarakhand hills.

Exploratory Statistics	Rural	Urban	Remarks
Weekly frequency of eating fast food	1–2 times	3–4 times	• Youth consume more fast food than any other age group on any given day.
On any given day, how many young people eat fast food (%)	5	16	• Men consume more fast food than women.
Youth spending on fast food (% of their annual income)	4	10	• Instant noodles are the most popular fast food item, which is generally consumed in rural areas, whereas in urban areas, a greater variety is available.
Reasons why fast food is popular among youth	Tastes good	Tastes good and convenient	• Youth earning more money tend to eat more fast food than those with lower incomes.
Awareness among youth about the health risks of fast food	Nil	Limited	

Sample size of about 1000 youth representing both rural and nearby urban areas.

Here, we cite a few examples of local healthy food consumed routinely by native communities in remote, high-altitude locations. A traditional breakfast meal, *Sattu*, of raw barley mixed with salted *thuner* (*Taxus baccata* L., Himalayan yew) tea, keeps the high-altitude *Bhotia* tribes of Uttarakhand’s hills healthy. The bark of the *thuner* traditionally has been used by native populations for treating common colds, coughs, fevers and pain; its uses are described in Ayurveda and Unani medicine. It received attention recently as its leaves and bark were found to be the prime source of taxol, a potent anti-cancer drug. Similarly, buckwheat chapatis are commonly eaten with clarified butter and honey, which is also considered a healthy and nutritious meal eaten by high-altitude native *Bhotia* communities. Buckwheat is a versatile grain that is a naturally gluten-free food with high protein and fibre content; it can be steamed and eaten in whole-grain form like rice, or the whole seed can be ground into a fine flour.

The Uttarakhand food tradition has been one of sharing. Communal dining is woven deeply into the fabric of rural hill communities. Local festivals and wedding feasts have been occasions for hill communities to come and dine together, cooked by the family with love. For hill communities, food is *prasad*, or grace. It is a blessing that is savoured by everyone, created by the community for the community. This is what ‘slow food’ is: a tapestry of culinary interdependence that holds communities together.

Taking the example of rice, we documented about 180 named landraces or varieties of rice, mostly suited to rainfed hill farming. Traditional wisdom regarding the ethno-medicinal properties of these varieties is the result of generations of hill farmers' hard work and ingenuity. Farmers reported on the introduction of some high-yielding rice and wheat varieties, particularly in river valleys under assured irrigation, which depended on the use of inorganic fertilisers and pesticides for increased productivity. This has resulted in the depletion of soil quality and yield stagnation and farmers are reverting back to their traditional varieties and traditional ways of crop production.

Across the Himalayas, as weather patterns become more unpredictable, farmers are discovering that traditional crops are more resistant to natural stresses than cash crops. With climate change looming, farmers are turning back to their roots—traditional crop varieties—and away from rice–wheat cropping to a multi-cropping system, even in river valleys where improved agriculture is practised.

3.5. Addressing the Food Insecurity of Migration-Prone Hill Communities through Subsidised Community Canteens

Subsidised canteens can help meet the food needs of migrant rural youth and urban workers by directly providing tasty, nutritious native food, and also helping them to save a large part of the limited earnings that would otherwise be spent on food. Subsidised community canteens serving locally sourced, healthy, and nutritious food to the urban poor will address their food and nutrition security. This could also help revive traditional hill farming, as a greater quantity of local food beyond the subsistence needs of the native farming communities would have to be produced and marketed locally, which would also help address the employment needs of rural youth.

Migrant youth in urban areas do not have Public Distribution System (PDS) ration cards for subsidized food items. The plight of migrant youth during the COVID-19 pandemic has provided important lessons, as they were among the most food insecure and vulnerable during the lockdown. Subsidised community canteens could thus play a significant role in addressing food insecurity in such emergencies.

Serving local food in community canteens, schools, universities, hospitals, and restaurants will also address the nutrition security and wellbeing of youth and other poor people. Women's self-help groups can be employed in these community canteens, which can be set up in government buildings to reduce costs.

Moreover, the state government could create a system whereby community canteens in urban and peri-urban areas buy farm produce directly from farmers at the 'minimum support price', eliminating intermediaries. Over time, this strategy may provide better food security for rural and urban poor than the current one, which is based on low-cost food availability through the PDS—a system that, as has been widely reported, is prone to corruption and poor management.

While these measures are welcome, they may fall short of reaching all sections of the food-insecure population. Most migrant workers do not live with their families and many do not cook their meals. Instead, a significant number rely on roadside street vendors and *dhabas* (eating houses).

Community canteens could also contribute to jobs (income generation), economic growth, and food and nutrition security. One community canteen serving about 500 beneficiaries on average would generate about 20 jobs. Thus, an estimated 1000 canteens across the Uttarakhand hills would generate about 20,000 jobs and serve more than 500,000 meals a day. These canteens would also help bridge the nourishment gap among poor urban and peri-urban workers. Additionally, the government could use community canteens to shift diets and agricultural production towards more sustainable, and sustainably harvested, healthy, and nutritious local food crops. These canteens' menus would include low-cost yet nutritious and environmentally sustainable, locally sourced food items, including coarse grains such as millets, native pulses, green leafy vegetables,

and even locally sourced seasonal fruits. They would create demand for farmers to diversify their crops and focus on sustainably harvested produce.

3.6. Youth Engagement in Promoting Community-Based Agri-Ecotourism

Uttarakhand state has already taken initiatives for community-based ecotourism and some ecotourism circuits have been identified. The present research, however, explores how ecotourism and tourism around agricultural landscapes (agri-ecotourism) can be combined and how reviving hill agriculture and homestays can be made a livelihood strategy for hill communities.

A proposed action plan to develop an agri-ecotourism model site is presented in Table 9.

Table 9. Proposed actions to develop a model agri-ecotourism site and the need for policy support.

Major Proposed Actions/Activities
<ul style="list-style-type: none"> ● Identify a traditional production landscape with an optimum hillside area of about 100–200 ha, preferably 1–2 km away from a motorable road. ● Motivate the farmers in the area of the proposed site to form farmer cooperatives and pool their land for collective or joint organic farming. ● At the proposed site, define areas for the following specific uses: <ul style="list-style-type: none"> - Prime agricultural land to grow a variety of native crops while maintaining high within-species diversity; - Incorporate compatible agroforestry species into the production landscape; - Include livestock such as cattle, goats, buffalo, and poultry to depict a traditional crop–livestock mixed-farming practice of hill agriculture; - Create a herbal garden with medicinal and aromatic herbs from the area; - Build 4–5 large polylined rainwater harvesting tanks with a total water storage capacity of 100,000 to 200,000 L for use as lifesaving irrigation in rainfed hill farming; - Demonstrate cold water fish farming in polytanks; - Revive poorly managed common property resources around farmlands by planting native wild economic species and other broadleaved forestry and agroforestry species. ● Build homestays or farmstays in traditional style and serve local, authentic, healthy food to visitors in homestays and also at farm-gate restaurants. ● Encourage local chefs to innovate by adding value to local cuisines using a variety of native crops. ● Sell local handicrafts, local clothing, and processed foods (pickles, juices, jams, and other foods) to visitors at the farm gate. Women’s self-help groups can facilitate craft making and food processing. ● Use agri-ecotourism sites to launch educational campaigns that emphasize agroecology-based sustainable agriculture and food system models and educate visitors about indigenous food sovereignty. ● Organize guided tours to nearby famous ecosites. A youth self-help group can facilitate the activity. ● Surplus food produced on farms can be sold locally (community canteens, school/university canteens, city restaurants, community-supported farming activities, school feeding programs, etc.).
<p>Technical, social and policy support needed</p> <ul style="list-style-type: none"> ● In hilly areas where arable land is limited and highly fragmented, cooperative farming should be the norm. Farmers should be allowed to share land for collective farming, to produce enough food for tourists, and to sell surplus produce locally. ● Financial assistance or credit facilities are needed to transform a rural farming landscape into an agri-ecotourism site. ● Financial support to all households to furnish a room as a homestay facility for visitors. ● Skill development of rural youth in the hospitality business and as an expert in educational campaigns that present models of sustainable agriculture and food systems and integrate and demonstrate aspects of agroecology and indigenous food sovereignty. ● Invite volunteers specialised in sustainable development issues, environmentalists, biodiversity conservationists, nutrition experts, natural farming, and natural food experts, etc. The volunteers can guide the native host communities in making the visitors’ stay memorable.

Initially, agri-ecotourism sites can be developed successfully where ecotourism activities are already active, such as famous trekking routes to nature reserves and Himalayan glaciers. Table 10 lists some priority agri-ecotourism sites with well-known eco-tourism destinations.

Table 10. Probable agri-ecotourism sites with the possibility of guided tours/treks to nearby famous ecosites in the Uttarakhand Himalayas.

Famous Sites for Promoting Agri-ecotourism	District	Guided Tours/Treks to Nearby Famous Ecosites
1. Har-ki-Doon valley	Uttarkashi	<ul style="list-style-type: none"> The cultural landscapes of the villages of Sankri, Saud, Taluka, Osla, and Seema, as well as mountain peaks such as Bandarpoonch, Kalanag, Swargarohini, and Kedarkantha are highlights of the Har-ki-Doon Trek. Upon reaching Har-ki-Doon valley, one can explore the Morinda Lake, Jaundhar Glacier, and Borasu Pass. The famous Kedarkantha trek located within the Govind Wildlife Sanctuary also starts from the village of Sankri. The nearest town, Purola, is the gateway to the Har-ki-Doon valley. The valley of Purola is said to be one of the most fertile and widest valleys in the region.
2. Bhilangana valley	Tehri Garhwal	<ul style="list-style-type: none"> Bhilangana valley is the gateway to the famous Khatling Glacier Trek. The views of famous Himalayan peaks such as Kairi, Draupadi-ka-Danda, and Janoli are other attractions.
3. Urgam valley	Chamoli	<ul style="list-style-type: none"> Urgam valley is known for its natural and spiritual beauty. Urgam village is famous for Kalpeshwer temple, which is one of the ancient Shiva temples, and also the Panch Kedar. Urgam valley is also known for its agricultural landscape and crop diversity.
4. Pindar valley	Bageshwar	<ul style="list-style-type: none"> Pindar valley is among the most beautiful and frequently explored valleys in the Uttarakhand Himalayas, situated on the southeast edge of the legendary peaks Nanada Devi and Nanda Kot. The Pindari Glacier Trek is considered a perfect blend of adventure and culture.
5. Johar valley	Pithoragarh	<ul style="list-style-type: none"> A former trade route to Tibet, Johar valley in Uttarakhand is a haven for serious trekkers on the lookout for virgin trails across the Himalayas. Abandoned ghost villages, fabulous terrain, and views of the great Nanda Devi and the Milam glacier beckon the trekker into a journey through landscapes and time.
6. Darma valley	Pithoragarh	<ul style="list-style-type: none"> The Darma valley trek is a relatively unexplored trek known for offering mesmerizing scenic beauty. The highlights include incredible views of majestic Panchachuli peaks, enchanting Darma valley, rich cultures and traditions of remote villages, and mesmerizing natural beauty throughout the trek route.

Besides agri-ecotourism around nature treks, sites can also be developed around many religious tourism locations. Among the possibilities are the Mahasu temple on Tuni-Mori road at Hanol in the Jaunsar area of Dehradun district (Figure 3A), Budha Kedar in Bhilangana valley of Tehri Garhwal district in the Garhwal region (Figure 3B), the Baijnath temple complex in Bageshwar district (Figure 3C), and the Baleshwar temple complex in Champawat district in the Kumaon region (Figure 3D) of the Uttarakhand hills. The famous valleys around these temple complexes are Purola valley, Bhilanga valley, and Garur valley, with great potential to be developed as model agri-ecotourism sites.

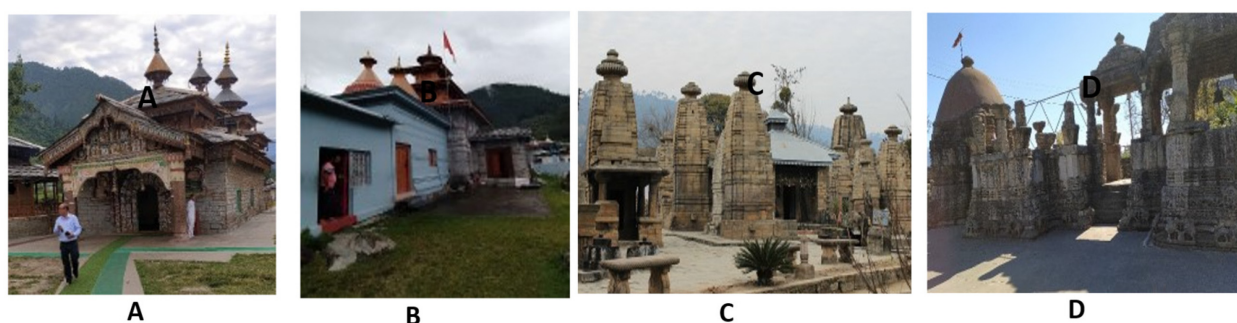


Figure 3. Famous temples/temple complexes of cultural significance in Uttarakhand: (A) Mahasu, (B) Budha Kedar, (C) Baijnath, and (D) Baleshwar.

In an exploratory survey, we documented the numbers of nature-based tourists visiting the Uttarakhand hills (Table 11) and found that the ‘hardcore’ and ‘dedicated’ types of tourists (as defined in Table 11) constitute about 35% of the total, which is of particular interest in an agri-ecotourism context.

Table 11. Nature-based tourist numbers in the Uttarakhand hills.

Nature-Based Tourist Category *	Main Characteristics	Tourist Numbers (%) **
Hardcore	Members of educational or conservation trips, or research scientists; accepting of modest comforts.	15
Dedicated	Visitors to protected areas who are tolerant of little amenities and interested in learning about the local natural history.	20
Mainstream	People that travel to exotic natural destinations purely for the novelty.	30
Casual	Those who visit natural areas unintentionally or as part of a larger journey.	35

* Adopted from Lindberg (1991) [26]; ** About 1000 tourists visiting famous nature reserve sites/ecotourism sites of the Uttarakhand hills, as indicated in Table 10, were surveyed.

The proposed agri-ecotourism will mainly take the form of homestay tourism, which will have a significant impact on food production and consumption in the tourist destinations. Table 12 provides an overview of the potential positive effects of such tourism on food system transformation in the Uttarakhand hills.

Table 12. Potential positive effects of homestay agri-ecotourism on food system transformation in the Uttarakhand hills.

Key Positive Effects of Homestay Agri-Ecotourism on Local Food Systems

- Homestay tourism helps revitalize and enrich the food culture of the Uttarakhand hills as the dining experience becomes part of the daily lives of guests and hosts throughout the year.
- The host family’s children will be exposed to the gastronomic knowledge of regional cuisines from a young age, which will pique their curiosity about discovering more about traditional culinary specialties and preserving the culinary heritage.
- Guests’ appreciation for local indigenous food will boost cultural pride and confidence among the host community.
- Members of various ethnic communities often share their knowledge of ethnic cuisine with members of other ethnicities, thereby bringing new foods into their homes for their guests or sharing lost knowledge of certain recipes.

Table 12. *Cont.***Key Positive Effects of Homestay Agri-Ecotourism on Local Food Systems**

- The increased use of homegrown organic vegetables and dairy products, as well as the use of wild economic species in dietary diversity, are generally sought after by guests. The use of in-season local foods improves nutrition and health.
- Arranging cooking classes for guests and cultural blending through guest–host interactions, as well as the creolization of food items, is also possible and helps enrich local food culture and its diversification.
- Creolization of food, or cultural blending, will motivate youth to innovate and opt for a career in the hospitality industry. Moreover, interacting with guests will help young family members learn more about the standards and practices of the hospitality industry.
- Cultural blending with foreign guests in homestays often brings notable improvements in host families as well, particularly regarding awareness of balanced diets, healthy eating patterns, and nutritional balance.
- Host families will have the opportunity to learn about new food trends such as gluten-free foods, food allergies, and organic foods, which will help increase their knowledge of the local diet. This awareness leads to a healthy diet for host families. A similar pattern will be established in the host’s food culture by providing tourists with a balanced and healthy diet over time.

4. Discussion**4.1. Local Food Systems, Youth Migration, and Food Insecurity**

Obtaining as much available information as possible about which foods are produced, consumed, exported, and imported helps communities gain a picture of the region’s food economy and how it might change. In the absence of nutritious local foods, developing a food guide can be a helpful tool for educating consumers, institutional food buyers, educators, policymakers, and area farmers about the potential benefits of producing and consuming more local foods sustainably.

Traditional farming has been the primary source of livelihood for mountain communities in the Uttarakhand hills until the past two to three decades. However, with rapid urbanisation after the region acquired full statehood in 2000, young people have increasingly been migrating to urban centres for education and also for off-farm jobs. Initially, very few households had the resources to migrate, mainly for the purpose of providing higher education for their children and access to better health facilities, but having now reached 30% permanent migration, many mid-hill farming landscapes have been completely abandoned. Even poor households that do not have the resources to migrate abandon farming, relying mainly on food subsidies or food aid under the PDS and depend on off-farm petty jobs in the community for cash. These farm households have thus become highly food insecure.

About 70% of rural households have at least one member who is a seasonal migrant, earning cash income for the family. Of the total rural youth population, 75% are migrants; the majority of them are engaged in off-farm employment in urban centres within the state or out of the state and only 15% are pursuing higher education or professional courses. About 55% of migrant youth are mostly unskilled and work as wage labourers in the informal sector.

Young people do not aspire to become farmers when they leave school; instead, they aspire to move into white-collar professions. Only 7% of rural youth plan to pursue agriculture as their livelihood. We also found a sharp increase in youth out-migration in recent years. A major concern is the 20% of rural youth not in education, employment, or training (NEET), who are at risk of becoming socially excluded—individuals with income below the poverty line and lacking the skills to improve their economic situation. These youth could be gainfully employed in farming and food system transformation, given political will and policy support.

We discovered that permanent rural youth migration is primarily from areas with low agricultural production and limited economic incentives, such as the middle and high hills.

Seasonal migration occurs from all agricultural production areas, but more frequently from these same areas.

With poor agricultural productivity, 60% of rural farming communities are food insecure. Migrant youth in nearby urban centres are also not finding better employment opportunities and much of their disposable income is spent on buying food. Migrant workers struggled particularly during the COVID-19 pandemic because they experienced severe food insecurity when there was a lack of food and they did not have enough money to buy food.

Young people in rural farming areas in Uttarakhand's hills often shy away from working in low-productivity agriculture. In the absence of decent work opportunities and access to social services and protection, they join the flow of internal and international migrants. In many regions, women and older people are left to take care of the farm and face major constraints in accessing resources to improve their productivity. Addressing those inequalities through more inclusive rural transformations and the reconfiguration of rural–urban linkages is a major challenge for the coming decades.

In addition, climate change in Uttarakhand will increasingly force people to abandon farming at high altitudes and move to the plains. This may accelerate the trend of people migrating and leaving the land fallow [28]. Out-migration from rural areas of the hill districts of the state has become a major problem, resulting in many depopulated hamlets or villages whose population has declined drastically [29].

In the Himalayas, environmental constraints impose severe restrictions on the carrying capacity of natural resources, as well as on the efficiency of infrastructure and services. As a result, subsistence farming constitutes the main source of rural food and livelihood. Due to the constraints of the subsistence economy, a large proportion of the male youth population leaves rural areas in search of livelihood and employment, resulting in a scarcity of farm labour. Moreover, it has been observed that the increasing trend of male out-migration not only provided stability to the rural economy in terms of income through remittances but also marginally improved women's access to education, local institutions, resources, development opportunities, positions of grass-roots leadership, and natural resource management [30].

Migration to cities, both temporary and permanent, is a common strategy to increase rural livelihood resilience by diversifying household incomes. However, migration from rural areas to cities is perceived as a concern, leading to rising unemployment, the lack of means to provide services to new arrivals, and the proliferation of urban slums, particularly in some big cities. Poverty, limited rural employment opportunities, and decreasing land availability are the factors pushing people to leave. Only the poorest rural dwellers, and households that do not have a family history or network of formal employment, are able to move due to their lack of means [31].

Lopsided development, due to the concentration of more economic activities in plain areas of the state, leading to huge income inequalities between hill and plain districts, has been the reason for youth migration from hills to plain areas [29]. Per capita income (measured in terms of per capita net district domestic product) in hill districts (Bageshwar, Champawat, Tehri Garhwal, and Almora) is almost half that of the plain districts (Dehradun and Haridwar) [32]. Addressing those inequalities through more inclusive rural transformations and the reconfiguration of rural–urban linkages is a major challenge for the coming decades.

In the Uttarakhand hills, unemployment has been a major issue in rural areas, with more than half of all out-migration occurring for work [33]. Our study suggests that employment opportunities can be enhanced through the establishment of institutions, the development of infrastructure, imparting higher education and innovation in agriculture, which will minimise out-migration from rural areas. Arguably, the single largest global development challenge in the decades to come will be the need to integrate hundreds of millions of young people into the labour market [9].

A comprehensive view of the local food economy that takes into account both urban and rural issues is stressed by the creation of harmonious urban–rural linkages. Everyone is affected by these issues, which range from agricultural preservation to community health to food access. Planning and developing local food policies is a key component that connects the production and distribution facets of a local food economy. A food policy can establish new connections with local farmers, particularly those who are dedicated to sustainable agriculture, in addition to deciding and coordinating the methods in which community members have access to nutritious food. It is also necessary to conduct research that integrates agriculture and land use policy into regional planning. Under the overall eco-nutrition framework, a food-based approach to community nutrition and health is another crucial area in need of policy support. The problems of food insecurity could be addressed through enhanced household subsistence production. Further, it seems improbable that everyone quitting agriculture can find respectable off-farm jobs or other livelihood possibilities due to the high rate of urban population expansion and urbanisation in the Uttarakhand hills.

With the abandonment of hilly arable land and the large-scale migration of rural youth to urban centres, both the low-income migrants and the rural population overall risk food insecurity. In the absence of healthy local food resources, the food choices of the migrant youth will change, and this can result in undernutrition, obesity, and other food-related non-communicable diseases. Fast food consumption in cities will rise as traditional, locally sourced, healthy food becomes scarce. Reviving traditional farming will benefit both rural and urban communities, as traditional foods will be more accessible if they are produced beyond subsistence levels and marketed locally.

4.2. Engaging Rural Youth in Food System Transformation

The role of young people in transforming food systems is considered critical. There is a need for more mountain-centric development strategies to transform the migration-prone hill region into a destination of greater employment and income opportunities for local youth.

Today's youth generation is the largest in history and the global population of young people is concentrated more in low- and middle-income countries located in South and East Asia and Africa [9,34]. Owing to the size of this global demographic cohort, their role in many development trajectories, including the future sustainability of food systems, is considered important.

Youth, as a group, has special stakes in food systems and the need to engage with youth in relation to the sustainable transformation of food systems is greatly emphasized [11]. Policymakers, planners, and other interested parties must pay attention to the contribution of food systems to deteriorating human health systems and high greenhouse gas (GHG) emissions, putting pressure on the sustainability of natural resource use and failing to provide enough livelihood opportunities for the upcoming youth bulge.

The world today faces a complex problem of malnutrition, with undernutrition and micronutrient deficiency coexisting with overweight and obesity and food-related non-communicable diseases [35–39]. These diverse forms of malnutrition must be combated through concerted action [40]. Food policy and food system analysts have called for a thorough transformation of food systems for all forms of sustainable development objectives [12,41–46]. Policymakers and development agencies are very interested in empowering young people's energy and agency to change the food system because they are food producers and consumers as well as potential entrepreneurs and innovators [9,11].

The types of agricultural livelihood opportunities that are open to young rural men and women will be determined partly by the agricultural and economic geographies in which they live and partly by their access to productive assets and resources, particularly land, but also capital and technology [47,48], as well as output markets [49].

Deliberating on the economic, cultural, and social dimensions of engaging rural youth in food system transformation, policymakers, and academics are debating agriculture's

and the agri-food sector's overall capacity to provide jobs and decent work for young people [11,12,48,50–57].

The world's agriculture faces a looming problem of generational succession, which until recently has gone unnoticed in both research and policy discourse [58]. Most countries' farming populations are aging and many farmers have no successors; despite high rural youth unemployment rates, it is widely assumed that young people are uninterested in farming [59].

Thinking about young people and farming raises fundamental questions about the future, both of rural young women and men and of agriculture itself, which is at a crossroads [60]. The challenges that young people face in becoming farmers must be taken seriously and given much more attention than has been the case in recent policy debates and research if sustainable agricultural futures are to be realised and if young people are to have a place in those futures.

A cautious and circumspect attitude towards youth as potential agents of change has been recommended [11]. All social groups, including youth and others, are likely to need support to overcome structural obstacles, access resources, acquire skills, build confidence, and feel empowered to create, build, and pursue new, sustainable, and productive livelihoods, including new ways to produce, process, distribute, and consume food.

Major challenges with respect to increasing rural youth's participation in the agriculture sector and how these challenges can be overcome have been duly emphasized [9]. In the context of the Uttarakhand hills, there is a distinct need to improve rural youth's, and more particularly young rural women's, access to education and to incorporate agricultural skills into rural education more generally. Agricultural training and education must also be adapted to ensure that graduates' skills meet the needs of rural labour markets. Uttarakhand's youth have a natural inclination towards the hospitality industry. As there is great potential for developing community-based ecotourism and agri-ecotourism in Uttarakhand, and homestays are becoming increasingly popular among nature-based tourists, rural youth need a particular set of skills in hospitality and tourism in general and ecotourism and agri-ecotourism in particular. This aspect is discussed in greater detail later in this section.

In the hills of Uttarakhand, farm holdings are small and highly fragmented, and there is limited scope for land consolidation. In order to have economies of scale, there is, therefore, a need to pool agricultural land for collective or joint farming through farmer cooperatives. In this regard, encouraging youth to form farmer cooperatives and form informal savings clubs can be beneficial. Rural youth do not have the skills (or access to the necessary skill-upgrading opportunities) to partake in the green economy. Improving youth's access to education and training—including formal and informal on-the-job training—is needed to redress this skills mismatch.

Another important challenge is young people's limited access to markets as, without such access, they will not be able to engage in viable and sustainable agricultural ventures. Young rural women face additional constraints in accessing markets, due in part to the fact that their freedom of movement is sometimes limited by cultural norms. Improving access to education, training, and market information can facilitate youth's access to markets, with niche markets offering particularly significant opportunities for young farmers. Facilitating their involvement in youth producers' groups can be similarly beneficial in this respect. In the entire Uttarakhand state, there are 26 principal market yards, 31 submarket yards, and 27 weekly markets for marketing agricultural produce. However, the majority of the districts of this state are located in hilly regions, while the principal markets are primarily located in the plains. Although the entire hill region is covered under the Agricultural Produce Market Act of 1964, the major hill markets are still non-functioning [61]. Therefore, it can be deduced that the state's hill regions require special attention in terms of marketing interventions and infrastructure due to the difficult terrain and growers' limited bargaining and handling capacity, as a result of small holdings and a lack of resources.

Due to the limited participation of young people in political dialogue, their complex and diverse needs are often not taken into account. Policies often fail to consider the diversity of young people and do not provide effective support. Solving this problem requires the skills and competencies that young people need to act collectively to ensure their voices are heard. Political decision makers themselves also need to actively involve young people in the political decision-making process.

Addressing the above challenges is critical to increasing youth engagement in the agricultural sector and ultimately to harnessing the full untapped potential of this large and growing demographic. Encouraging the participation of youth groups in agriculture, especially in developing countries, has the potential to drive widespread rural poverty reduction for both young people and adults [9]. These challenges are complex and interconnected, but with a growing world population and declining agricultural productivity growth, young people must play a central role in ensuring a food secure future. A coordinated response to increase youth engagement in the agricultural sector is more important than ever.

The rural youth not in employment, education, or training (NEET) are a significant concern in the context of Uttarakhand's hills, and they need to be gainfully employed in food system transformation. The share of NEET youth in 2020—the latest year for which a global estimate is available—rose to 23.3 percent, an increase of 1.5 percentage points from the previous year and a level not seen in at least 15 years. This group of young people is especially vulnerable to having their labour market opportunities and outcomes deteriorate over time as 'scarring' effects take hold [62].

Intergenerational solidarity is likely to play a key role in Uttarakhand's food system transformation, bringing together the experiential knowledge of older/elderly farmers in traditional hill farming techniques and local cuisines and the youth conversant in ICT around food systems. Additionally, there is a natural propensity among young people in Uttarakhand for the catering and hospitality industries, which must be capitalised on through locally relevant skill development.

4.3. Addressing the Food Insecurity of Migration-Prone Hill Communities through Subsidized Community Canteens

Often termed 'populist', community canteen schemes acknowledge a major gap in the food and nutrition requirements of the urban poor—an increasing proportion of the overall urban population—and migrant youth. These migrant youth are marginalised and the rising cost of agricultural produce and restaurant or street food has a significant impact on them and other urban poor in general.

Many Indian state governments have experimented with subsidising canteens over the last few years. According to media reports, the canteens in most states have been popular, a fact borne out by the long lines often seen outside. Intended for the urban poor, these canteens usually serve food at subsidised rates. The concept of subsidised food canteens gained popularity following the success of 'Amma' canteens in Tamil Nadu, which were launched in 2013 by former Chief Minister J. Jayalalitha.

A 2013 survey [63] on Amma canteens in Salem (Tamil Nadu) found that the customers were highly satisfied with them. Customers were mostly daily wage earners, casual labourers, schoolchildren, abandoned elderly, and low-salaried employees such as delivery boys and sales staff, who perceived that they could eat fairly well-balanced and healthy food, served hot and hygienically. Some low-income migrants felt that their food expenses had been reduced a lot, allowing them to save and send more money to their families. Officials from foreign countries, for example, Egypt, have visited these canteens to study them.

Community kitchens are a food security measure for those who cannot fend for themselves. However, such initiatives are equally important for working people in urban areas as a source of inexpensive and nutritious food. When there are food price hikes, the poor are often the hardest hit. Community kitchens can provide relief at such times

by offering food at fixed prices. In fact, the canteen survey found that their presence had forced private eateries to reduce their prices [64].

Strengthening localised marketing and directly supplying local produce to community canteens and similar canteens at schools, universities, and hospitals would help revive traditional hill farming and generate more employment at the community level for rural youth.

Additionally, the slow food movement is currently sweeping the Indian market and, as it gains momentum, the responsibility to promote sustainable, organic, and local cuisine falls on the hospitality industry as a whole, where our young people should lead the way. It is possible to preserve centuries of experience and traditions of older generations; otherwise, we will lose the options, flavours, diverse landscapes, and wildlife associated with traditional farming. Organizations and individuals will work with rural youth to revitalize this food and help bring tangible results to small producers to sustain and sustain local jobs around these economies.

4.4. Youth Engagement in Promoting Community-Based Agri-Ecotourism

Agri-ecotourism is a symbiotic relationship between tourism and agriculture, where farmers and farms play a key role in development and contribute to a more prosperous rural economy. Agri-ecotourism utilizes rural culture as a tourism resource. It is taking on new dimensions as a potential source of income and employment. Agri-ecotourism is an important opportunity to develop niche markets based on new food and nutrition experiences for tourists and consumers with traditional crops, and new educational experiences through exposure to different agricultural production systems. The combination of tourism and agriculture in agri-ecotourism is an environmentally friendly and socially responsible form of tourism.

The Indian Himalayan region is traditionally both an agricultural and a tourism-dominated area. Most people derive their livelihoods from these sectors. However, unplanned growth in these sectors has contributed to the Himalayan region's insecurity and the depletion of natural resources. To sustain these sectors, a combined agri-ecotourism development is needed in the area for the sustainable development of rural areas as well as conserving the environment.

Ecotourism is well developed in Uttarakhand and agri-ecotourism is an upcoming area with huge potential to revive traditional hill farming and provide employment for rural youth. The state of Uttarakhand has six national parks, seven wildlife sanctuaries, and four conservation reserves. All of these draw tourists from all over the world who enjoy trekking and mountaineering, as well as a large number of nature lovers, including ecologists, botanists, zoologists, and ornithologists [25]. The national parks, such as Nanda Devi and the Valley of Flowers, part of the western Himalayas, have already been included in the list of world heritage sites by the United Nations Educational, Scientific and Cultural Organization [65].

Agri-ecotourism involves interacting with indigenous people whose farming and herding practises are part of their customary knowledge and cultural identity and can be experienced first-hand. Experiencing authentic local foods is considered an important part of what makes an eco-holiday enjoyable and memorable; therefore, traditional food has an important role in agri-ecotourism. Engaging youth in agri-ecotourism and, particularly, making homestays a livelihood strategy, is considered important for their employment prospects. Community-based ecotourism or agri-ecotourism that provides a livelihood strategy—that can be managed and maintained at the local level—has a greater chance of truly benefiting the local population.

As people across the globe search for unique travel experiences that combine natural beauty with cultural and architectural appreciation, remote locations, such as those of the Uttarakhand hills, as listed in Table 10, are increasingly sought after as ideal destinations. Community provision of homestays is emerging as a sustainable tourism trend globally. Intended to increase the benefits and reduce the negative impact caused by tourism, the

concept seeks to protect natural environments and wildlife, provide authentic tourist experiences that celebrate and conserve heritage and culture, and create socio-economic benefits for communities through employment opportunities [66].

Homestays should emphasise cultural practices as well as create a genuine interest and commitment among the local people in the region [67]. Homestays are intended to attract tourists with a certain demographic profile who desire authentic experiences [68–70].

Homestays in rural villages located at the base camps of many nature tracks and hikes in Uttarakhand and at the proposed agri-ecotourism sites, as indicated in Table 10, will contribute to ecologically sustainable tourism in Uttarakhand. Guided treks to ecotourism sites can make local people more appreciative protectors of their own natural wealth and cultural heritage. While female youth self-help groups can be gainfully involved in food preparations for the visitors in farmstays or homestays, male youth self-help groups can earn a decent livelihood from educational campaigns about sustainable hill farming practises and guided tours/treks to nearby sights [71].

During the past decade, tourist arrivals have shown unprecedented growth in the Indian Himalayan region, including Uttarakhand, and it is expected that visits will increase manyfold in the future [72]. Tourists are increasingly interested in visiting natural areas and observing wildlife. Agri-ecotourism is an upcoming element within sustainable agriculture that helps enhance biodiversity in production landscapes by implementing the core principles of ecotourism and incorporating the essential practises of eco-agriculture and permaculture.

In the wake of travel bans across the world during the recent COVID-19 pandemic, rising air ticket costs and uncertainty meant international travel was restricted; instead visitors started opting for short-haul trips. Many domestic tourists now prefer to explore their own country rather than go abroad because of the various uncertainties attached, and more and more tourists now prefer lesser-known, nature-friendly areas; the Uttarakhand hills have benefitted from this trend.

The homestay facilities at the agricultural farm and nearby villages will have the following features:

- A fairly remote rural location.
- Developed in response to large-scale migration of rural youth, declining local economies, and increased tourism activities.
- Ties to conservation of the natural environment and the revival of traditional subsistence farming.
- Preservation of the built environment, native food culture, and native cuisine.
- Ample social interactions for tourists and local communities.

Further, community-based homestay tourism has also been reported to influence the host community's local food culture. Local food cultures keep changing and tourism has been shown to influence such dynamics. Community-based tourism focuses on intense host–guest interaction experiences, often exposing various tangible and intangible aspects of the host food culture to tourists. Studies on the relationship between food and tourism are predominantly focused on tourists' perspectives, so there is a need to explore the host perspective, particularly regarding the influence of tourism on local food culture [73,74].

Creating food or cultural blending could motivate young people to innovate and choose a career in the hospitality industry. Furthermore, interacting with guests will help young family members learn more about the standards and manners of the hospitality industry. The host families will be provided with the opportunity to learn about and showcase new food trends such as gluten-free food, food allergies, and organic food, which will be a valuable addition to their local food knowledge. The experiential knowledge of older farmers in this field, which they are not often able to describe, will be properly documented. This awareness leads to healthy food consumption among host family members. Serving balanced and healthy meals for tourists for an extended period is expected to establish similar patterns in the host dining culture.

The latest Godrej Food Trends report [75] states that 87.1% of food experts believe people will travel more to experience culinary culture and cuisine in the coming years. Recognizing its potential beyond its rich culture and heritage, the country's tourism industry is now tapping into such culinary travel opportunities. The focus will be on more traditional food systems, inherent wisdom in culinary practices, and building a connection with what we eat.

5. Conclusions

Traditional mountain agriculture in Uttarakhand has long been a subsistence-oriented, highly labour-intensive, closed-loop and diverse production system, and farming has traditionally been the backbone of the rural economy, as well as a way of life and livelihood for native communities. Until a few decades ago, rural youth played an important role as the primary labour force in various agricultural operations, and some were also willingly opting for farming as a career. However, many young people now shy away from working in low-productivity agriculture. In the absence of decent work opportunities and access to social services and protection, they migrate to urban areas within the state or beyond. Addressing these constraints through more inclusive rural transformations and the reconfiguration of rural–urban linkages is a major challenge for the coming decades.

Working the land is highly unpopular among rural youth for two primary reasons: (i) traditional hill farming is not economically rewarding and (ii) it does not provide year-round employment. The agricultural sector, therefore, must be transformed to become a more youth-friendly and stimulating environment. There are opportunities to be explored and barriers to be removed.

In this exploratory research, we investigated opportunities to involve rural young people in the transformation of the food system. Improving the production and consumption of local food not only benefits the health and wellbeing of local communities, but it also has many economic, social, and environmental benefits. Youth have a special stake in food systems and policymakers, planners, and other interested parties must be aware of the negative impact of current food systems. Deteriorating human health, high GHG emissions, greater pressure on the sustainability of natural resource use, and failing to provide enough livelihood opportunities for the upcoming surge in young job seekers are the major negative impacts of the present food system.

Access to knowledge, information, and education can improve the skills of youth along the food value chain and can motivate them to take the lead in innovation. It also helps to make connections and can be used by state administration to promote the agricultural sector as a profitable venture to attract youth.

Enhanced food production will lead to enhanced consumption when supplied to canteens in schools, universities, hospitals, urban restaurants, etc. Furthermore, local foods served in community canteens will have much-needed food security addressed and better employability of rural youth around food systems.

Besides the food security of migrant rural youth, community kitchens are a food security measure for those who cannot fully fend for themselves financially. However, such initiatives are equally important for working people in urban areas as a source of inexpensive and nutritious food. When there are food price hikes, as during the lockdown in the COVID-19 pandemic, the poor are the hardest hit and community kitchens can provide relief in such emergencies by offering food at subsidized prices. Strengthening localised marketing and directly supplying local produce to community, school, university, and hospital canteens would help revive traditional hill farming and generate employment at the community level for rural youth.

One important proposal for reviving mountain agriculture is exploiting the opportunities of agri-ecotourism and homestay culinary tourism, for which Uttarakhand has great potential. Some of the main features of agri-ecotourism homestays are as follows: (i) an initiative developed in response to large-scale migration of rural youth, declining local economies, and increased tourism activities; (ii) conservation of the natural environ-

ment and the revival of traditional subsistence farming; and (iii) host–guest interaction experiences. Recognizing its potential beyond its rich culture and heritage, Uttarakhand’s culinary tourism opportunities would benefit from and provide a broader appeal by focussing on traditional food systems, the inherent wisdom in culinary practices, and building a connection with what we eat.

Innovations are crucial in terms of opportunities for rural youth as agents of change, if traditional activities such as farming or tourism are to become more productive. Institutional innovations that invest in educating and training young rural people in developing entrepreneurship around food systems are also important.

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