

CHALLENGES OF AGRICULTURE IN UTTARAKHAND HIMALAYA

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ABSTRACT

The Himalayan state Uttarakhand's geographical distribution divides the state into two parts: the hilly region with typical topography and harsh conditions for living, and the plain region with fertile lands. More than 80 percent comes from the hilly part of the state with typical mountains and valleys. Agriculture is subsidiary in nature in the hills on small and marginal lands that are in the shape of terraces. The practice of agriculture is not so easy in these mountains; there are a number of constraints in the hilly regions, from technique adoption to marketing of the agricultural produce. As the farmers in these hills face a number of difficulties in growing their crops, agriculture is still the main occupation among rural households. The present paper is an attempt to study the challenges of agriculture in the mountains of the Kumaun region in Uttarakhand state.

Keywords: *Agriculture, Mountains, Rural*

INTRODUCTION

Agriculture is the primary need for the survival of human beings on earth, and the timeline history of agriculture shows how the evolution of this basic human need was done over time. As per the historians, about 10,000–12,000 years ago, human agriculture activities on earth were started. This was the time when human beings gradually learned how to grow crops and settled down their lives. They started to settle at one place and transition their hunting life for food to a settled crop cultivation and animal rearing life. In later years, with evolution, agriculture was one of the main variables in the economic development of farmers as well as the economy of any country. Production from agriculture was the backbone of the industrial revolution, which started in the eighteenth century and changed the world scenario slowly. Agriculture has been in practice for the last ten or twelve thousand years, and it is a big part of the economy along with the food provided to human beings for survival on earth.

STATUS OF AGRICULTURE IN THE HILLS OF UTTARAKHAND

Agriculture in the hilly regions of Uttarakhand is mostly traditional in nature, with diverse and complex features. The economy of this region is primarily agrarian, and more than two-thirds of the population is directly or indirectly engaged in agriculture, which resides in villages in the hills with typical topography and harsh living conditions. Agriculture, mixed with animal husbandry and horticulture, is the main occupation among households, and this puts a high pressure on the population on arable land in this region. The most part of the population relies on agriculture due to the lack of opportunities in other sources of livelihood, i.e., the secondary or tertiary sector sources, because the development of these two sectors in the hilly region is limited. The agriculture sector in the hills is also underdeveloped, and fragility, inaccessibility, heterogeneity, self-containment, renewable resource base, self-dependence, resilience, self-fulfilment, environment friendliness, and minimum risk possibilities are the principal characteristics of the mountain farming system (*Singh, 1996*).

As the agricultural income is not sufficient for the survival of the families in rural areas of hills for the year, mostly from all households, some family members, especially male members, migrate to earn money to fulfil the economic requirements of the family. Women are the backbone of the rural hill economy engaged in agriculture and allied activities. Their hard work and share in agriculture and allied activities in the family is comparatively higher than those of men from time immemorial. Even the present, when men in the family mostly migrate for the

betterment of their family by getting employment in different parts of the country, hill agriculture is mostly dependent on women in the family.

The state has four agro-climatic zones covering six altitudinal farming approaches (<https://www.prepdata.org>) as per the climatic condition, height, and slope of mountains. The overall pattern of Uttarakhand is typically an underdeveloped agricultural economy (<https://farmech.dac.gov.in>). The cropping pattern and farming practices are adopted according to the topography, climate, rainfall, and other factors over the generations. Farmers generally practice growing three crops in two years, and about 90 percent (<https://farmech.dac.gov.in>) of the total cropped area is subsistence farming. Commercial farming has a negligible share in the hill farming, and this type of farming is mostly practiced in the plain regions of the state.

Monsoon is one of the main influencing variables in hill agriculture, which accounts for 70–75 percent (<https://farmech.dac.gov.in>) of the total cropped area under the Kharif cropping pattern. Rice, wheat, sugarcane, maize, soybeans, pulses, oilseeds, and a number of fruits and vegetables are grown in the state. The state has potential to grow a wide variety of agricultural produce. The net sown area under hills is about 56.8 percent (<https://dehradun.kvk4.in>), and the net irrigated area to net sown area is about 45 percent (<https://agriculture.uk.gov.in>), and it is mostly available to the plains of the state. This makes the agriculture rainfed in the hill farming and subsistent in nature with traditional farming techniques in scattered small and marginal terrace fields.

INTRODUCTION TO THE STUDY AREA

The study area is located in the north-western part of the country, which is also pronounced as 'Devbhoomi - Land of Gods' and has a 53483 sq. km. geographical area. With its natural scenic beauty and pilgrimage centre, the state was carved from Uttar Pradesh and became the 27th state of the Republic of India on November 9, 2000. Due to the typical topography, the state is divided into two divisions, namely Garhwal and Kumaun. Administratively, the state is divided into thirteen districts, of which seven are in the Garhwal region and six in the Kumaun region. In the north-western part, the state shares international boundaries with China and in the east with Nepal. The state shares its inter-state boundaries with Himanchal Pradesh in the north-west and with Uttar Pradesh in the south. The state is mostly mountainous in the northern part, consisting of cliffs, valleys, and ridges, and forms a typical topography. Uttarakhand has one of the fastest-growing economies. The main growth drivers in the economy of the state are hill agriculture,

with an emphasis on horticulture, including aromatic and medicinal plants, and tourism (<https://www.ibef.org/states/Uttarakhand-presentation>).

MAJOR CHALLENGES IN AGRICULTURE

1. **Small Size, Fragmented, and Terrace Fields:** As the majority of the total geographical area of the state comes under forests and wasteland, only about 14 percent of the land is used for agriculture and horticulture practices in the state. Mostly these agricultural lands are small and marginal in size in Uttarakhand, especially in hilly regions, and the share of this type of land in the state is higher, as if we compare it to the national average (<https://shm.uk.gov.in>), almost 70 percent of the land holdings are marginal and 18 percent are small (Mittal *et al.*, 2008). A very high percentage of small and marginal farmers makes agriculture input costs much higher in terrace fields.
2. **Low fertility of soil:** Soil fertility refers to the inherent capacity of the soil to supply essential nutrients to the plants in adequate and right proportion (Bhattacharya *et al.*, 2020). Soil fertility is one of the important components that determines productivity. The state has diversified soil in different ecological zones, and there is much variation in the type of soil from one place to another. The Tarai, Shivalik's, and Duns (<900) in general have alluviums that are rich in nutrients and therefore fertile and productive for crop production (Pareek *et al.*, 2019). In the hills of the state, the land is less fertile due to soil erosion on the steep slopes, compared with the fertile land in the plain regions of the state. Poor to moderate soil fertility on the mountain slopes limits agricultural production (Chopra, 2014) and results in low production and productivity in mountain agriculture.
3. **Lack of Modern Technology:** As the state is an agrarian economy, the farmers of Uttarakhand, especially small and marginal farmers who are practicing agriculture in the hills, still depend on traditional techniques and are far behind modern technology, even in the twentieth century. These methods are labour-intensive and time-consuming, but result in low productivity in return. The poor farmers don't have access to new machines and modern farming equipment as they are economically weak (Chauhan, 2015) on one side and another side, the typical topography, scattered terraced small and marginal landholdings, high vertical intervals between the landholdings, and the absence or lack of infrastructure are also some constraints in not using modern technology. So, in this

way, the farmers in the hills have no choice but to get rid of this cost-effective method of agriculture.

4. **Irrigation as an issue** Irrigation predominantly occurs on the plains. 87 percent of the land is irrigated in the plains, compared to a mere 10 percent in the hills (<https://www.prepdata.org/dashboards/uttarakhand-agriculture-dashboard>). In these hilly regions, agriculture is largely rainfed and mostly depends on monsoons. Being a large area under hills, state irrigation facilities are either in plain parts of the state or in river valleys in the hill area, and the rest of the area is rainfed. The difficult geographical constraint greatly limits the development of irrigation facilities in the hilly districts of the state (*Report: State Agricultural Plan, Uttarakhand, p. 19*). The net irrigated area to the net sown area is about 45 percent in Uttarakhand. In some parts of the hills, rainwater harvesting, drip irrigation, etc. have been adopted by the farmers in recent years, but the majority of the land is rainfed, and farming totally depends on rainwater.
5. **Use of Traditional Seed and Fertilizer:** Generally, farmers in the hilly regions tend not to use inorganic fertilizer; instead, they rely on composting and farmyard manure (FYM) to maintain fertility (<https://www.wmduk.gov.in>), and it is almost negligible. They also preserve the seeds in the traditional way for sowing, and the reason behind this is that the majority of the farmers, especially small and marginal ones, don't have access to quality seeds (<https://haldivity.com>). These seeds are used by them even today, when the HYV seeds have a number of varieties for different crops, but the structure of hill farming is mostly traditional.
6. **Traditional Cropping Pattern:** The cropping pattern in the terrace farming in the hills of Uttarakhand is generally three crops in two years at most places, and mostly it seems like traditional underdeveloped agriculture where it is rainfed in nature. This pattern is known as the Sari system. In the first year, wheat, barley, and lentil are sown in the fields during Rabi season, while in Kharif season, rice and barnyard are sown as mixed crops, and in the next Kharif season, twelve or more crops are cultivated in an intermixed pattern (*Chandra et al., 2020*). At higher altitudes, only Kharif crops are available due to the extremely cold winter months (*Report: State Agriculture Plan: 2012–17, p.*
7. **Threats to Wild Life:** The human-wildlife conflict is a big problem among the farmers of hilly regions in the state. The animal agro-ecosystems are vulnerable to man-animal interfaces that cause casualties as well as crop damage (*Pandey et al., 2019*). Wild boar and monkeys are the main wildlife threats to the farmers in the hills, as one digs up their

fields mostly at night, eats and destroys the crop, and monkeys come in gangs during the daytime and destroy by eating the agricultural as well as horticultural produce. So, there is no way for the farmers to get rid of these wildlife threats. Seriously, agriculture faces a threat from the wildlife in the hills, which is one of the reasons that farmers abandon agriculture and leave their fields fallow.

8. **Change in Climate** The three ways in which climate change impacts agriculture are increased stress on water, increased risk of floods, and changes in crop yields (*Das, 2021*). The changing pattern of climate is increasing the number of farmers day-by-day, forcing them to shift their farming areas or abandon their fields. The change in rainfall and temperature rise, even in the winters, have affected agriculture, resulting in a decrease in productivity and quality of the crop. However, over time, changing climatic conditions, especially the weakening of the summer monsoon and shifts in the groundwater level, have triggered changes in indigenous agriculture practices (*Phodhani et al., 2019*). Fluctuating rainfall mostly affects marginal farmers, and they struggle with this problem in the hilly regions of the state.
9. **Geohydrological Disasters:** The state is highly prone to geohydrological disasters - landslides, flash floods, cloudbursts, debris flows, rock falls, extreme weather, and submergence (*Sati:2023*). The impact of debris flows and flash floods creates problems for the lives of households where this takes place, and if we see it from the point of view of agriculture, it damages the arable land, cropland, and crops, degrading the arable land and the overall lives of the people. The threat of geohydrological disasters, especially the cloudburst in the state, is mainly during the rainy season and makes a heavy economic loss and also a threat to life in the region where the disaster took place.
10. **Marketing Constraints:** The nature of agriculture in hilly regions of the state is still subsistence in nature even after the half century of the Green Revolution due to a number of constraints, and marketing facilities are also one of them. On the one hand, there are insufficient agricultural produce storage facilities in the hills, and on the other, there are few or no agro-processing units operating. Mainly, the agro-processing industries are developed in plain regions, and due to the lack of transport and some other constraints, small and marginal farmers have no or less opportunity to sell their agricultural produce if it is surplus from their domestic use.

The problems, apart from those mentioned above, in hill farming are related to infrastructure too. Less developed road network, lack of sufficient transportation, non-availability of

communication network, less access to banks and credit, lack of proper market, warehouse, or cold storage are also problems among the farmers in the hills, which force them to abandon farming and transform into non-farm activities so that they can earn a livelihood.

CONCLUSION AND SUGGESTIONS

The topography, infrastructure, and some other constraints have identified hill agriculture as subsistence agriculture, even though the state has diversified agro-climatic zones. The issues make agriculture at a survival level in the hills, and still there are little changes even after a long time had passed. This resulted in low productivity of agriculture after hard labour in the fields by the farmers. As agriculture is trailing in the hills of Uttarakhand, a continuous migration is going to happen from these hills, which resulted in a number of villages in 'Ghost Villages'.

Some suggestions in the context of the above-mentioned problems can be as follows:

- The planting of fruit trees in the forest to stop wild life attacks by ensuring more fruit trees are made available for them in forests. This practice is being adopted by some villagers in Uttarakhand to protect their crops from wild animals, and at the same time, digging water resources, i.e., chal and khals, in the jungle for wild animals will stop or reduce the frequency of wild animals moving towards villages.
- A special focus should be given to the quality of seeds that are suitable for hilly regions on the one hand and can be afforded by small and marginal farmers on the other. The farmers can be aware of using these quality seeds through workshops, awareness programs, and information and communication technologies.
- Using cow manure or compost in growing the crops can be an opportunity for growing cash crops in an organic way, which is the demand of the market at the current time and can be income-generating for them.
- Apart from agriculture, the other practices related to this sector should be practiced by the farmers, i.e., animal husbandry etc.
- There is a good potential for medicinal and aromatic plants in the hilly regions, so the farmers should be encouraged to grow such plants, and the government should ensure them for selling their products so that they gain confidence in growing such cash crops instead of traditional farming.



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- As the state is a well-known tourist destination, agro-ecotourism and culinary tourism can be a hope for the villages for creating self-employment through agriculture and improving local food supply chains as per the demand of the market.
 - As the government introduced a separate industrial policy for the hills of the state, a separate agricultural policy is also needed for the development of agriculture in the hills and to stop the migration.
 - The women are the backbone of hill agriculture, it is important to appreciate and encourage them by providing knowledge of new agriculture techniques.

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