

P-ISSN: 2706-7483
E-ISSN: 2706-7491
IJGGE 2024; 6(2): 187-194
www.geojournal.net
Received: 13-08-2024
Accepted: 17-09-2024

Puran Ch. Joshi
Assistant Professor,
Department of Geography,
SSJ University, Almora,
Uttarakhand, India

Siddhant Khulbe
Assistant Professor,
Department of Economics,
STPG College Sitarganj,
Uttarakhand, India

Arun Kalkhundiya
Assistant Professor,
Department of Zoology, SSJ
University, Almora,
Uttarakhand, India

Corresponding Author:
Puran Ch. Joshi
Assistant Professor,
Department of Geography,
SSJ University, Almora,
Uttarakhand, India

Climate change and its impacts on agricultural landuse and migration in Almora district of Uttarakhand: Study from salt and Bhikiyasain blocks

Puran Ch. Joshi, Siddhant Khulbe and Arun Kalkhundiya

DOI: <https://dx.doi.org/10.22271/27067483.2024.v6.i2c.304>

Abstract

Climate change is one of the major global problems of present. It is bringing significant changes in entire environmental processes. Annual weather pattern is changing and people are facing problems in their daily life due to the changes in livelihood practices. The Himalayas are also not untouched with it. The Himalayas are divided into their parallel ranges. The central Himalaya is dense populated part of this mighty mountain range. Present paper discusses the climate change and its impacts on agriculture in the study area because agriculture is the back bone of hills from very ancient period. So it is necessary to understand the factors which are giving an adverse impacts on it because Himalayan people are directly associated for their livelihood with agricultural practices. It is also impacting out migration in the study area.

Keywords: Climate change, Himalaya, migration, landuse, livelihood

Introduction

The human population is responsible for the land use change on the Earth's surface. In the initial period of civilization, forest land was converted into agricultural land then agricultural land was converted into built-up land. It is a continuous process. First, we must understand the land use. There is one more term called 'land cover'. Land use and land cover refer to the physical and functional characteristics of the Earth's surface within a particular region. Their concepts are interrelated, but still, there is a difference between them.

Land Use: Land use describes how humans utilize the land for various activities, such as residential, agricultural, industrial, commercial, recreational, or conservation purposes. It focuses on human activities and the purpose for which land is used.

Land Cover: Land cover, on the other hand, refers to the physical or biological coverage of the Earth's surface, including natural and human-made features. It refers to the vegetation, water bodies, bare soil, impervious surfaces (such as roads and buildings), forests, wetlands, croplands, and other land features in an area.

Land use and land cover are often analyzed to understand the patterns and changes in the landscape. These concepts are essential for land management, urban planning, environmental assessment, and conservation efforts. By studying land use and land cover, researchers and policymakers can gain insights into the impacts of human activities on the environment and make informed decisions about resource management and sustainability.

If we talk about land use in Almora, it is rapidly changing. People are migrating from villages, so agricultural land use is also changing. In 2018-2019, the area of agricultural wasteland was 41552 hectares and 42819 hectares in 2020-2021. Land use change analyses play a crucial role in tracing out-migration patterns and understanding the factors that drive population movements. Land use change analyses provide valuable insights into migration dynamics by revealing the underlying environmental, social, and economic factors. Understanding these patterns is essential for developing effective policies and interventions to manage Migration, address its impacts, and promote sustainable development.

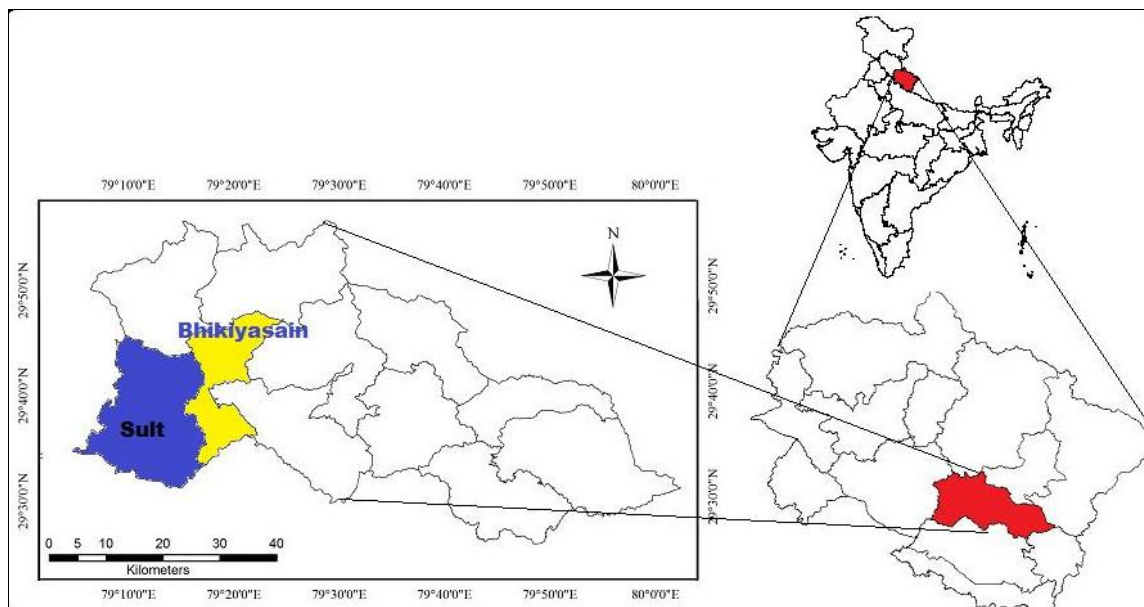


Fig 1: Location Map of the study area

Objectives

The study has following objectives:

1. To understand the landuse in Almora district
2. To understand the impacts of climate change on migration in the study area.

Materials and Methods

Present study is based on both primary and secondary data. Primary data has been taken from extensive field work. Primary survey has been conducted to understand the impacts of climate change. This survey has been conducted with the residents of villages located at different altitudes in the study area. Secondary data has been collected from various government and non-government departments. Graphs and tables have been created to make the research more effective.

Results and Discussions

Land use and land cover help us understand the economic growth condition in any area. These are closely interrelated. For example, if agricultural land is converted into built-up land, we can observe that the primary sector of the economy is going towards secondary or tertiary. These small but essential changes help to understand the complete picture of the area of investigation.

Table 1: Area of agricultural Wasteland of Almora District

Year	Agricultural Wasteland (in hec)
2018-2019	41552
2019-2020	41594
2020-2021	42819

Source: Statistical Hand Book, Almora

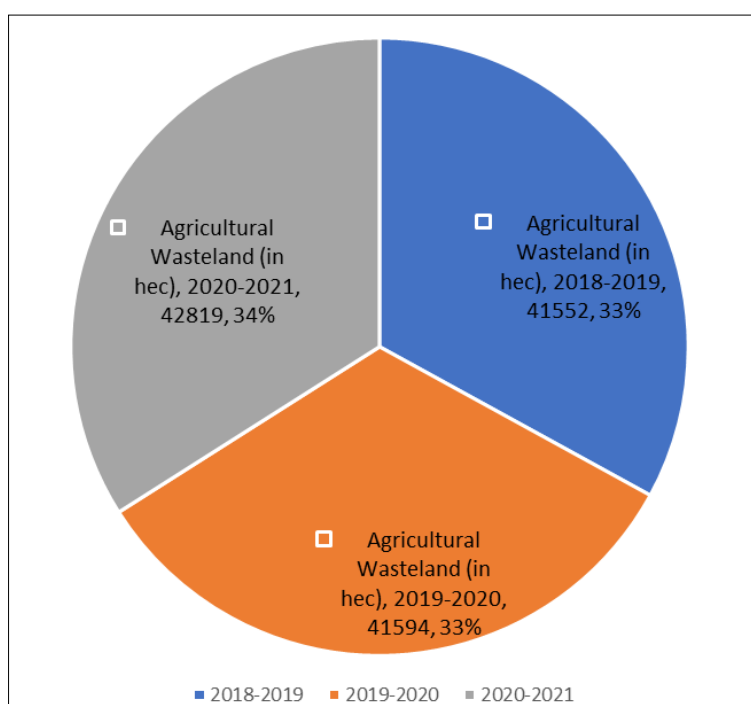


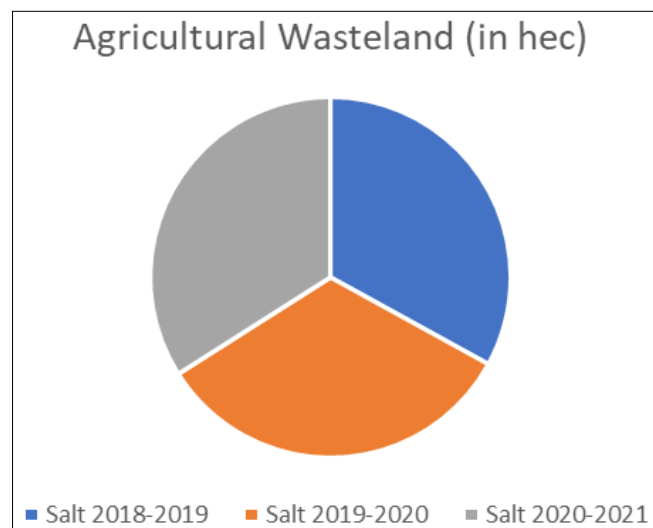
Fig 1: Area of Agricultural Wasteland (in hec) of District Almora

Table 2: Area of agricultural Waste land in Salt Block

Block	Year	Agricultural Wasteland (in hec)
Salt	2018-2019	11240
	2019-2020	11251
	2020-2021	11581

Source: Statistical Hand Book, Almora

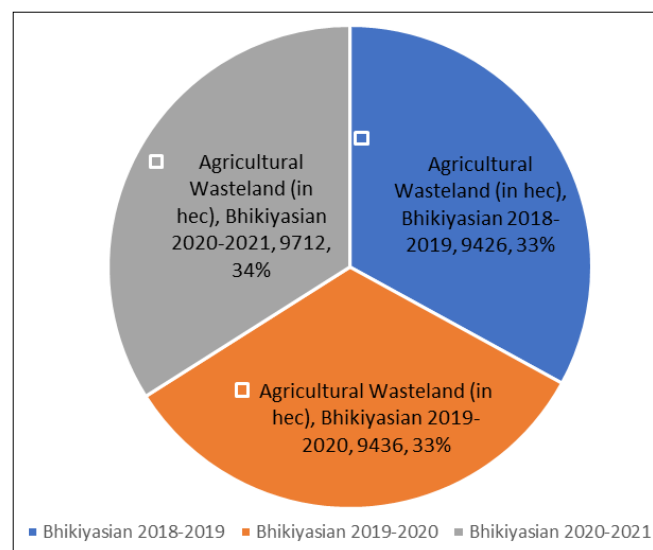
If we analyse table number 2, which represents the area of agricultural wasteland in Salt block, is increasing yearly. The same thing is happening for the Bhikiyasen block in Table number 3. In the year 2018-2019, the area of 11240 hectares for Salt; this has been increased in 2020-2021.

**Fig 2:** Agricultural Wasteland (in HEC)**Table 3:** Area of agricultural Wasteland in Bhikiyasen Block

Block	Year	Agricultural Wasteland (in hec)
Bhikiyasen	2018-2019	9426
	2019-2020	9436
	2020-2021	9712

Source: Statistical Hand Book, Almora

Table number 3 is clearly showing the increased area for the Bhikiyasen block in 2019-2020 & 2020-2021, respectively. If we analyze table number 6.1, the Agricultural wasteland area is increasing district as a whole.

**Fig 3:** Agricultural Wasteland (in HEC)

So, we can say firmly say that both the blocks have migration and people are changing their traditional occupation, i.e., agriculture. Researchers found in the study area that huge agricultural land was left barren during the fieldwork.

Agricultural production & migration

The Himalayas present challenging conditions for agriculture and resource utilization due to their rising heights, steep slopes, and harsh climate. These factors impose severe restrictions on the region's productivity and carrying capacity of natural resources. As a result, most of the population in the Himalayas relies on subsistence farming as the primary source of food and livelihood.

One of the primary challenges farmers face in the Himalayas is the limited availability of arable land. The steep slopes and rugged terrain make it difficult to find suitable areas for cultivation. Farmers often have to terrace the land and construct terraced fields to create flat surfaces for farming. However, even with these efforts, the amount of cultivable land remains limited, leading to small landholdings for most farmers. Low agricultural productivity can have a momentous impact on migration patterns. Here are several ways in which low agricultural productivity can affect Migration:

Economic Factors: Agriculture is often a primary source of income and livelihood for rural communities. When agricultural productivity is low, it can result in decreased incomes and limited job opportunities in the farming sector. As a result, people may be compelled to seek better economic prospects elsewhere, leading to rural-to-urban Migration or even international Migration.

Poverty and Food Insecurity: Low agricultural productivity can contribute to poverty and food insecurity in rural areas. Insufficient crop yields or failed harvests can lead to inadequate food supplies and increased vulnerability to hunger and malnutrition. In such situations, people may migrate for better access to food and economic opportunities.

Rural-Urban Migration: Low agricultural productivity can drive Migration from rural to urban areas. Urban centres often offer a more comprehensive range of employment opportunities in non-agricultural sectors, such as manufacturing, services, and construction. Individuals and families may move to cities for better-paying jobs and improved living conditions.

Land Degradation and Climate Change: Agricultural productivity can be vulnerable to land degradation, desertification. The adverse impacts of climate change, such as droughts, floods, and unpredictable weather patterns. These environmental factors can make farming less viable and push people to abandon their lands. Consequently, they may choose to migrate to areas less affected by such issues or to urban centers where alternative livelihood options are available.

Social Disruption: Low agricultural productivity can create social disturbance within rural communities. As people face challenges sustaining their livelihoods, social unity and traditional community structures may weaken. Sometimes,

this can lead to conflicts over limited resources, land disputes, or social unrest, prompting individuals to migrate to escape such conditions. It is important to note that low agricultural productivity is rarely the sole factor driving Migration. Migration decisions are influenced by economic,

social, political, and environmental factors. However, the impact of low agricultural productivity on Migration should not be overlooked, as it can play a significant role in shaping migration patterns, particularly in rural areas heavily dependent on agriculture.

Table 4: Percentage of Different Reasons behind Migration in Almora District

Reason	Percentage
Employment	47.78
Medical Facilities	8.61
Education	11.75
Infrastructure	3.81
Poor Agriculture Produce	8.37
Followed by the family that Migrated	2.68
Destruction of Agricultural by Wild Animals	10.99
Others	6.02

Source: Rural Development and Migration commission, Uttarakhand, Pauri Garhwal

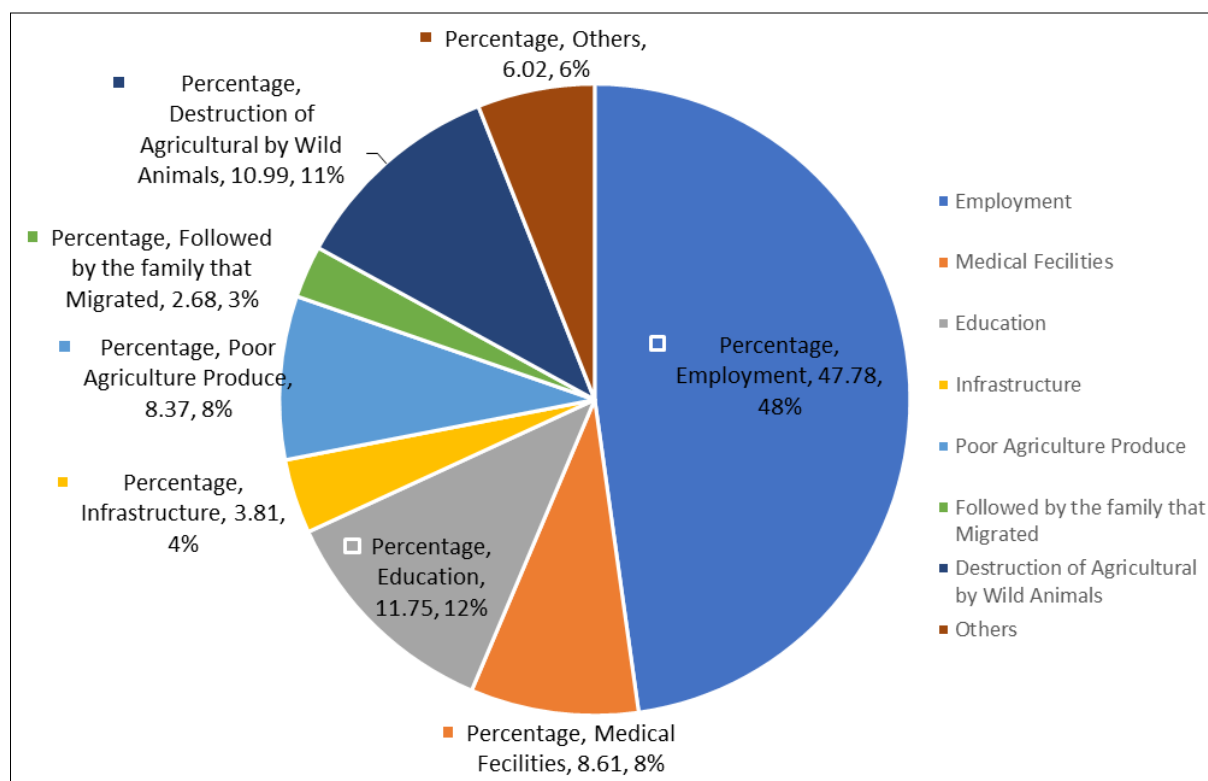


Fig 4: Percentage of Different Reasons behind Migration in Almora District

Table 4 shows the percentage of different migration reasons in the Almora district. If we study this table thoroughly, we can find that issues related to agricultural production are essential. A total of 19.26% reasons are related to poor agricultural produce and the destruction of agriculture by wild animals. If we segregate this value, it is 8.37 & 10.99, respectively.

So, we can say there are many reasons to migrate, but reasons related to agricultural production are essential to reason in one of them because it is directly related to food security which is very important in a democratic society. Overall, while subsistence farming remains the mainstay of the Himalayan population, the limited arable land, low agricultural productivity, and dependence on other natural resources highlight the need for sustainable development

strategies that can enhance livelihood opportunities and ensure food security in the region to check out Migration in the study area.

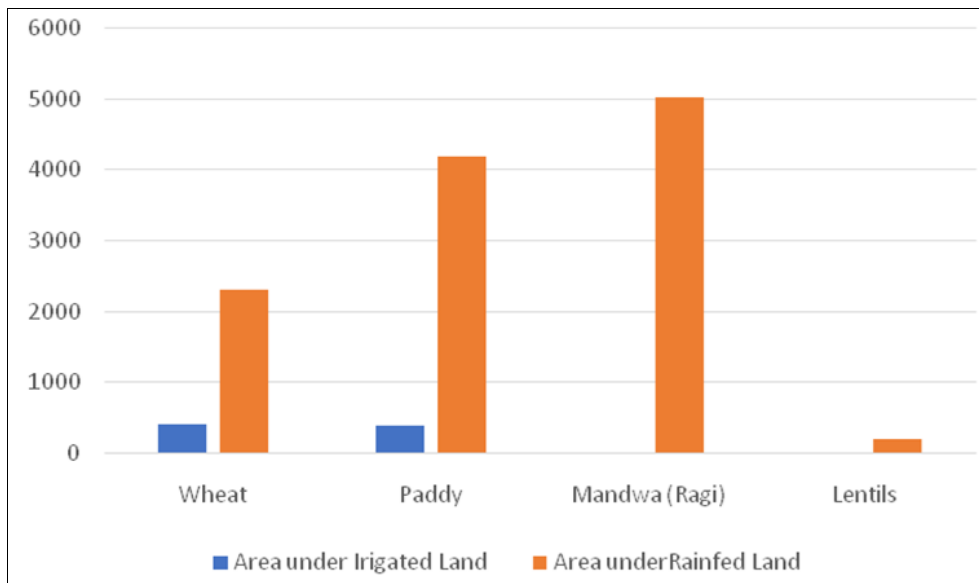
Agricultural Production and Migration In The Study Area

Two forms of agriculture can be seen in the Himalayan region. The first is irrigated, and the second is rainfed. Irrigated land is significantly less in amount, whereas a large amount of land is cultivated as rainfed agriculture. In mountainous regions, where agriculture depends on rainfall, the higher elevated areas are referred to as the "Uparanv" or "upland". The land where irrigation is practised is known as "Talaav" or "reservoir".

Table 5: Amount of Land under Different Food Grains According to Irrigated and Rainfed land in Bhikiyasain Block

Food Grains	Irrigated Land (Talav)	Rainfed Land (Upranv)
Wheat	382	2821
Paddy	384	1243
Mandwa (Ragi)	4	3235
Lentils		207

Source: Statistical Handbook Book (2020)

**Fig 5:** Amount of Land under Different Food Grains According to Irrigated and Rainfed land in Bhikiyasain Block**Table 6:** Amount of Land under Different Food Grains According to Irrigated and Rainfed land in Salt Block

Food Grains	Irrigated Land (Talaav)	Rainfed Land (Uparanv)
Wheat	399	2304
Paddy	389	4190
Mandwa (Ragi)	07	5020
Lentils		197

Source: Statistical Handbook Book (2020)

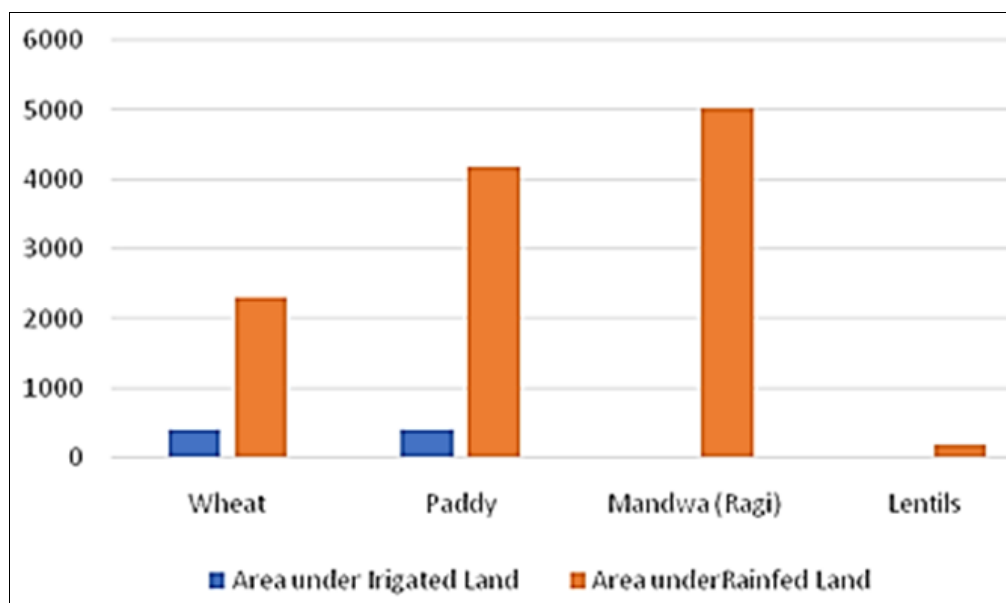
**Fig 6:** Amount of Land under Different Food Grains According to Irrigated and Rainfed Land in Salt Block

Table number 6 shows the total amount of land under rainfed and irrigated categories. Irrigated land is less in amount as compared to the category under rainfed. During the survey, the researcher found that production is also less in rainfed agriculture. People are leaving agriculture due to

low productivity. The planning commission of Uttarakhand state also identifies this fact. According to the report of the migration commission, 8.37% of people admit that low productivity is one primary reason in the whole state for Migration.

In mountainous regions, agriculture is indeed the primary source of livelihood. The possibility of commerce and trade is limited because agriculture in these areas primarily depends on weather conditions. However, in irrigated land, production is comparatively higher, allowing farmers to generate more income. Agricultural production is deficient in rainfed or non-irrigated land, and people rely solely on farming for their subsistence. In the present times, due to rapid population growth, agriculture is struggling to meet

the needs of the people.

Table 7: Production of different Food Grains in Almora District in Quintal/Hectare

Year	Food Grains	Wheat	Paddy	Lentils	Mandwa (Ragi)
2014-15		12.94	11.89	7.56	11.67
2015-16		11.47	11.70	7.12	12.68
2016-17		4.93	10.90	8.44	11.97

Source: Statistical Handbook Book (2020)

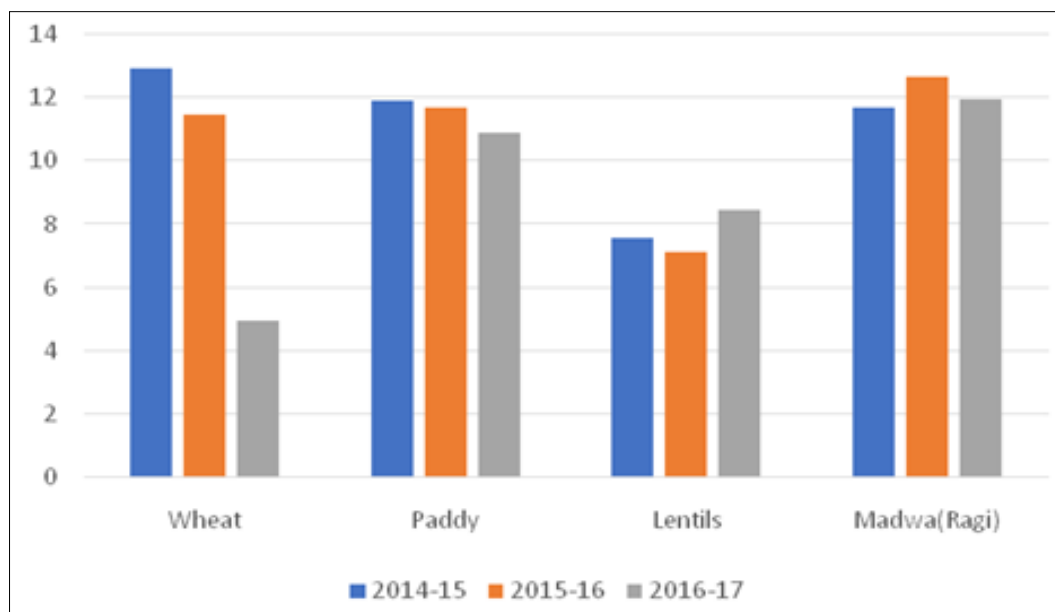


Fig 7: Production of different Food Grains in Almora District in Quintal/Hectare

According to table number 7 from 2014-2017, usually, a Decreasement is observed in agricultural production. It is subsistence agriculture from the past, but now this is impacted by climate change. Climate change has become one of the significant hurdles for decreasing crop production and productivity in the Himalayan region. Increasing temperatures, decreasing rainfall, and extreme weather conditions have been observed in the Himalayas. Agriculture is also destroyed by wild animals like monkeys and wild bears, forcing people to migrate.

A primary survey has been conducted by the researchers in both blocks with their inhabitants about agricultural productivity. A questionnaire was formed for the survey based on present and past agricultural productivity. It was

done with 300 households in the area of investigation.

Table 8: Comparison of Production of Different Food Grains in 30 years' time span

SN	Food Grains	Average production Before 30 years in kg/Nali*	Average Production in Present in kg/Nali*
1	Wheat	40	2
2	Paddy	35	2
3	Mandwa (Ragi)	50	5
4	Lentils	10	1

Source: Primary Survey

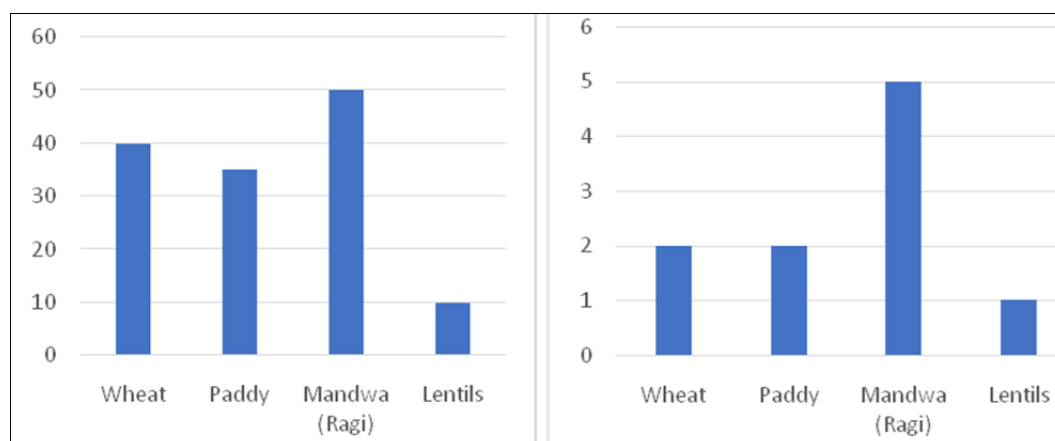


Fig 8: Comparison of Production of Different Food Grains in 30 years' Time Span

According to the table number 8, the production of different food grains is decreasing. Thirty years ago, people used to grow 40 kg wheat/Nali, which is now 2 kg/Nali* only. This pattern is typical in the entire study area. Respondents told many reasons behind it, which are the following:

1. Destruction of crops by wild animals such as wild boars and monkeys.
2. Erratic rainfall.
3. Extreme weather events, i.e., Landslides and Cloud

bursts.

4. Water resources are drying.
5. Unemployment

***1'Nali' is a local unit for land measurement & 1 Nali is equivalent to 2160 sq. Feet.**

6. Gloomy Visions of State
7. Attraction towards urban centres.



Plate 2: A Dried Traditional Water Source' Naula and Agricultural Waste Land

Both pictures represent an example of Migration and its causes in the area of investigation.

The rural regions of the Himalayas are particularly vulnerable to the impacts of climate change, which have triggered significant changes in land use patterns and migration trends. The interplay of environmental, social, and economic factors has transformed traditional livelihoods, especially agriculture, leading to the abandonment of farmland and increased migration.

1. Unpredictable Rainfall and Agricultural Decline

Climate change has altered weather patterns, causing irregular rainfall and extreme weather events such as droughts and floods. In the Himalayas, where rain-fed agriculture is dominant, these changes have resulted in reduced crop yields. Farmers, dependent on predictable seasonal patterns, face increased uncertainty. As agricultural productivity declines, many households abandon farming, leading to large-scale conversion of agricultural land into barren or unused land.

2. Land Abandonment and Forest Regrowth

In areas where farming is no longer viable due to erratic weather conditions, there has been a trend toward land abandonment. As fields are left uncultivated, natural vegetation and forests gradually reclaim this land. This process, known as "forest regrowth," has been observed in several Himalayan regions. While this may contribute positively to ecosystem recovery, it also signifies a loss of agricultural livelihoods for rural communities.

3. Out-Migration and Economic Shifts

The decline in agriculture has contributed to a rise in rural-to-urban migration, particularly among young men, leaving behind aging populations. The scarcity of employment opportunities in rural areas, exacerbated by climate impacts on traditional farming, has led many to migrate to urban areas or even other countries for work. This out-migration has affected community structures, labor availability, and

social support systems in rural Himalayan areas.

Conclusion

Climatic change has transformed many circumstances in the study area. Irregular rainfall patterns and extreme weather events are widespread in thrust areas.

Therefore, low agricultural Productivity and Migration are closely related. Land use pattern is also being changed by Migration in the study area. Agricultural land is converted into wasteland or barren land. Drying up water sources and abundant land are fundamental indicators of Migration.

There can be several reasons for land use change. In the Himalayas, climate change appears to be a major factor. Unirrigated land, which is dependent on rainfall, has experienced irregular rainfall due to climate change. As a result, agricultural yields have decreased, and people are abandoning farming, leading to rapid changes in land use.

Out-migration and land abandonment are the significant costs of declining agricultural production. Food security is another aspect in front of them. Low productivity in agriculture creates the problem of food security in the Himalayas. So, people are migrating from their villages to big cities.

References

1. Anmol J. Labour Migration and Remittances in Uttarakhand. In: Case Study Report. Kathmandu: International Centre for Integrated Mountain Development (ICIMOD); 2011. p. 11-15.
2. Bhandari G, Reddy CBV. Impact of Out-Migration on Agriculture and Women Work Load: An Economic Analysis of Hilly Regions of Uttarakhand, India. *Indian Journal of Agricultural Economics*. 2015;70(3):395-404.
3. Chand R. Diversification through high-value crops in Western Himalayan Region: Evidence from Himachal Pradesh. *Indian Journal of Agricultural Economics*. 1996;41(4):652-63.
4. Chettri R, *et al.* Land Abandonment and Forest

- Regrowth in the Indian Himalayas: A Response to Climate and Socio-Economic Drivers. Journal of Mountain Science; c2020.
5. Fatima K, Hussain A. Problems and prospects of hill farming. Research Journal of Agricultural Sciences. 2012;3:578-80.
 6. ICIMOD. Climate Change Impact on Food Security and Livelihoods in the Eastern Himalayas. International Centre for Integrated Mountain Development; c2017.
 7. Joshi B. Recent Trends of Rural Out-migration and its Socio-economic and Environmental Impacts in Uttarakhand Himalaya. Journal of Urban and Regional Studies on Contemporary India. 2018;4(2):6-7.
 8. Mangain RP, Reddy DN. Out-migration from Hill Region of Uttarakhand, Magnitude, Challenges and Policy Options. Project Report. Hyderabad: National Institute of Rural Development; c2015. p. 1-27.
 9. Roy PS, Dwivedi RS, Vijayan D. Application of Remote Sensing. NRSM; c2010. p. 21.
 10. Rural Development and Migration Commission, Uttarakhand. Analysis of Schemes and Programmes in the Rural Development Sector and Recommendations for Strengthening the Rural Socio-Economy in Order to Mitigate Out-Migration. Pauri Garhwal; c2019. p. 10.
 11. Sharma E, Bhuchar S, Xing M, Kothiyar B. Land Use Change and its Impact on Hydro-ecological Linkages in Himalayan Watersheds. Tropical Ecology. 2007;48(2):151-61.
 12. Sharma P, *et al.* Rural-Urban Migration and Climate Change: Insights from the Nepalese Himalayas. Migration and Development Journal; c2019.
 13. Sati VP, Kumar S. Declining agriculture in Garhwal Himalaya: Major drivers and implications. Cogent Social Science. 2023, 9(1).
 14. Tiwari PC, Joshi B. Natural and socio-economic factors affecting food security in the Himalayas. Food Security. 2012;4(4):195-207.
 15. Statistical Handbook, Almora; c2020.