Indian Journal of Agricultural Sciences **96** (2): 260–264, February 2026/Short Communication
https://doi.org/10.56093/ijas.v96i2.168053

Preserving heritage: An assessment of traditional rice (*Oryza sativa*) varieties and production patterns in the Someshwar valley, Almora

BHAWNA PANDEY[1], NAVEEN CHANDRA[2], M L UPADHYAY[1] and DHANI ARYA[1]*

Govind Ballabh Pant National Institute of Himalayan Environment, Ladakh Regional Centre, Leh, Ladakh 194 101, India

Received: 20 June 2025; Accepted: 27 January 2026

Keywords: Conservation, Human-wildlife conflict, Someshwar, Traditional varieties

Rice (*Oryza sativa* L.) is the world's most significant food crop, serving as the primary staple for over one-third of the global population (Khush 1997). It contributes 26% in the world's food production (FAO 1996). In the state of Uttarakhand, rice constitutes a major component of the daily diet and is primarily grown as a *kharif* crop in the hilly regions of Uttarakhand, with the growing season spanning from May/June to September/October. It is cultivated under both irrigated and rainfed conditions.

The Green Revolution significantly enhanced rice production through the introduction of high-yielding varieties, agrochemical inputs such as fertilisers, and irrigation infrastructure. However, a significant portion of farmers continued to cultivate traditional landraces due to their superior adaptability to diverse agro-climatic conditions (Bisht *et al.* 2007). Farming communities in interior regions rely solely on farmer-named local varieties, which are well adapted to their environmental conditions, socio-economic needs, and ethnic preferences (Mehta *et al.* 2008). There are several factors threatening the productivity and sustainability of rice-based agricultural systems, including inefficient utilisation of essential inputs such as fertilisers, water, and labour, adverse effects of climate change, emerging global energy crisis and rising fuel costs, escalating costs associated with rice cultivation, and socioeconomic changes such as urbanisation, labour migration, shifting employment preferences, and concerns regarding agricultural pollution (Ladha *et al.* 2009).

Traditional rice varieties possess a rich reservoir of genetic diversity, which holds significant potential for utilisation in breeding and varietal improvement programmes. Several studies on rice varieties have been documented from various geographical regions (Patra and Dhua 2003, Agnihotri *et al.* 2006, Mehta *et al.* 2008, Mehta *et al.* 2014, Mahajan *et al.* 2017). In this context, the present investigation was designed to evaluate the current status and extent of genetic diversity among traditional rice varieties in the Someshwar valley of Almora, Uttarakhand. This study seeked to support the conservation of these valuable landraces and promote their effective utilisation in future breeding strategies. By identifying and preserving diverse genotype, the research aimed to contribute to sustainable agricultural practices, strengthen food security, and assist local farmers enhance crop productivity and adopt effective integrated pest management techniques.

The present study was carried out during the rainy (*kharif*) season of 2024 in the Someshwar Valley of Almora district, Uttarakhand, a mid-Himalayan region where rice cultivation is predominantly rainfed and closely linked with traditional farming practices. The investigation covered six villages, namely Bhandari, Rait, Dalmodi, Falya, Palyura, and Ratkhola villages, selected to represent the variability in rice cultivation across the valley. Primary data on rice varieties were collected during the *kharif* cropping season of 2024 using a systematic random sampling method to select farm households in each village. A total of 66 informants representing a wide age range were randomly selected for interviews, including 38 men (58%) and 28 women (42%), with the majority belonging to the 50–70 year age group. Informant selection was guided by their extensive indigenous knowledge and long-term experience in the cultivation and utilisation of traditional rice varieties.

A structured questionnaire and interview schedule were developed to document information on locally grown rice varieties, including their local names, perceived yield, and changes in varietal composition over recent years. To explore indigenous knowledge and historical trends in greater depth, unstructured interviews were also conducted with selected respondents. Interviews were conducted in the local languages (Hindi and *Kumaoni*) to ensure effective communication and accurate documentation. Community members were encouraged to share local knowledge on rice variety utilisation in their native language to

[1]Singh Jeena University, Almora, Uttarakhand; [2]Govind Ballabh Pant National Institute of Himalayan Environment, Ladakh Regional Centre, Leh, Ladakh. *Corresponding author email: dhaniarya@gmail.com

enhance the authenticity and reliability of the information collected. The collected information was authenticated through consultations with knowledgeable elderly farmers and relevant secondary sources. The validated data were compiled, and the results were presented in tabular and graphical forms for effective interpretation of rice varietal diversity in the Someshwar valley.

The present study documented twelve traditional rice varieties (*Chaina*, *Thapchini*, *Lal Dhan*, *Nan Dhan*, *Basmati*, *Bakul*, *Anjan Dhan*, *Sav Dhan*, *Hansraj*, *Sunkhori*, *Bauradi Dhan*, and *Taichuni Dhan*) (Fig. 1), highlighting their ecological, and cultural diversity within local farming systems. Based on structured questionnaire surveys and community-based responses from local farmers, these landraces differ markedly in their sowing-harvesting cycles, moisture requirements, end-use values, and adaptive traits, reflecting long-term farmer-led selection under heterogeneous Himalayan agro-ecological conditions (Table 1). The continued cultivation of varieties such as *Chaina* under rainfed systems and *Sunkhori* and *Bakul* in relatively drier zones underscores the adaptive capacity of traditional rice germplasm to variable moisture regimes. Similarly, the prominence of aromatic varieties such as *Basmati* and *Nan Dhan*, along with culturally significant types such as *Sav Dhan***,** illustrates the integration of agronomic performance, culinary preference, and socio-cultural values in varietal selection. Furthermore, varieties such as *Bauradi Dhan* and *Bakul*, which are not cultivated for direct human consumption but are primarily used as livestock fodder, highlights the multifunctional role of traditional rice landraces within local farming systems.

Despite this diversity, the study revealed a substantial contraction in traditional rice cultivation over recent decades (Fig. 2). Several varieties, notably *Hansraj, Taichuni Dhan,* and *Bakul*, have reportedly disappeared from active cultivation, while others such as *Chaina, Nan Dhan, Basmati,* and *Anjan Dhan* exhibited pronounced declines in productivity. These trends point toward an accelerating process of on-farm genetic erosion. Supporting this trend, Rana *et al.* (2009**)** reported that of the 154 landraces collected in the Western Himalayan region, nearly 90 had reached a critical threshold of extinction and were likely to disappear within the subsequent 5–10 years. Earlier studies further corroborate this trajectory, documenting losses of traditional rice landraces ranging from 30–80% across different parts of the Western Himalaya (Rana *et al.* 2000, Maikhuri *et al.* 2001), underscoring the severity and rapid pace of genetic erosion in the region.

In contrast, *Lal Dhan* had demonstrated improved productivity, and *Thapchini Dhan* had remained relatively stable, suggesting that certain landraces possess traits conferring resilience under current environmental and management conditions (Table 2). Although *Sunkhori Dhan* had shown a recent decline, its comparatively higher average productivity indicated continued agronomic relevance. The observed changes in varietal composition and productivity are strongly linked to climatic variability and resource constraints. Farmers consistently reported erratic rainfall patterns, declining water availability, and reduced soil fertility, all of which disproportionately affect long-duration and water-intensive traditional varieties. Socio-economic transformations, particularly rural out-migration and labour

Table 1 Special features of rice varieties documented during field surveys

Rice variety	Sowing period	Harvesting period	Special features
Chaina	Mid-May	Early September	Grown only in rain fed areas, where irrigation is not available. Suitable for regions that rely solely on monsoon rains.
Thapchini	Mid-May	Early September	Known for its delicious taste when cooked, making it a preferred choice for meals.
Hansraj	Late May	Mid-September	A small-sized rice grain variety, often preferred for its texture and suitability for certain dishes.
Basmati	Mid-May	Early September	A highly aromatic rice variety, famous for its fragrance and long grains, commonly used for biryanis and special dishes.
Lal Dhan	Late May	Early September	Red in colour and is used both as regular rice and for making *Chuda Dhan* (flattened rice).
Sav Dhan	Early June	Late September	Cultivated exclusively for religious purposes and is used in rituals and offerings.
Taichuni Dhan	Early May	Mid-September	Mostly grown for the production of rice flour, which is used in various culinary preparations like bread and sweets.
Bauradi Dhan	Early May	Late September	Primarily grown as fodder for cattle, as the rice itself is considered to be of low taste quality for human consumption.
Nan Dhan	Early May	Mid-September	A variety with a pleasant aroma that also has the unique feature of increasing in quantity when cooked, making it an economical choice.
Sunkhori	Early May	Late September	A large-sized rice grain variety that thrives in dry areas, making it well-suited for regions with minimal rainfall.
Bakul	Early May	Late September	Grown in dry areas, primarily cultivated for producing *paral* (rice husk-based fodder) for cattle.

Fig. 1 Different varieties of rice found in the study area.

shortages, have further intensified these shifts. The migration of younger household members to urban areas has reduced the availability of agricultural labour, limiting the feasibility of cultivating labour-intensive traditional rice varieties. As a result, farmers increasingly prioritised varieties that require less management and offer more predictable returns. This demographic transition has, thus, emerged as a critical, yet often underappreciated, driver of agro-biodiversity loss in mountain agro-ecosystems. These patterns are consistent with the findings of Prasad *et al.* (2017) and Jain (2018).

Biotic stressors constitute another major constraint to traditional rice cultivation in the Someshwar valley. Farmers reported a noticeable increase in the frequency and severity of pest infestations, including rice stem borers (*Scirpophaga incertulas*), dung beetle larvae, and grasshoppers, along with various phytopathological disorders. These observations are consistent with earlier studies documenting significant yield losses in rice due to insect-pests and diseases across India (Thanh and Singh 2006, Singh *et al.* 2010, Jha *et al.* 2012, Mahajan *et al.* 2012, Singh *et al.* 2012, Mohapatra *et al.* 2013, Phenica *et al.* 2018). Yield losses ranging from 21–51%, as reported by Pasalu *et al.* (2004), underscore the vulnerability of traditional rice varieties under escalating biotic pressure, particularly in the absence of targeted extension support.

An additional and increasingly significant challenge reported by farmers is the rising incidence of human-wildlife conflict. Crop damage caused by wild animals such as monkeys (*Macaca* spp.), langurs (*Semnopithecus* spp.), wild boars (*Sus scrofa*), and deer has become more frequent and widespread. This persistent threat significantly contributes to crop losses and serves as a major deterrent to continued agricultural activity, particularly in the hilly regions of the valley. The severity of wildlife-induced damage has not only resulted in substantial economic losses but has also diminished local enthusiasm for the maintenance of traditional rice cultivation practices. Collectively, these findings underscore the dynamic and multifaceted challenges confronting traditional rice cultivation in the Someshwar valley. The interplay of environmental stressors, socio-economic changes, and ecological disruptions is catalysing a gradual but marked shift in regional agricultural systems.

The findings further revealed a marked decline and local disappearance of some varieties, indicating ongoing erosion of rice agro-biodiversity in the region. This decline is driven by multiple interacting factors, notably climate variability, water scarcity, soil fertility degradation, increased pest pressure, labour shortages associated with rural out-migration, and escalating human-wildlife conflict. The gradual abandonment of traditional varieties thus signifies a structural shift in mountain agro-biodiversity, where resilience-based diversity is being replaced by risk-avoidance strategies focused on short-duration, low-input crops. This transformation has critical implications for food security, climate resilience,

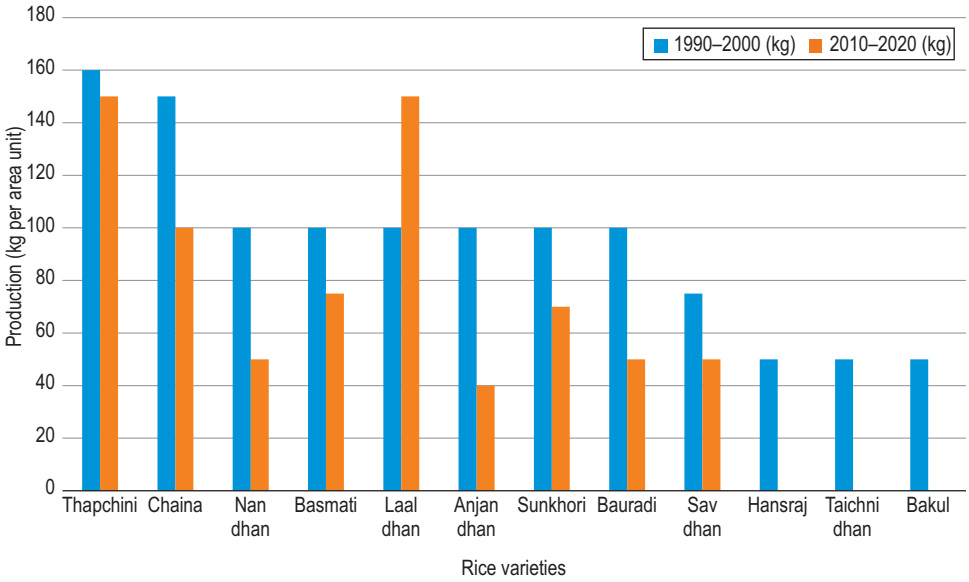

Fig. 2 Comparison graph of rice production in the study area from 1990–2020.

Table 2 Total area and production of rice in Someshwar valley documented during field surveys

Rice varieties	Total area and production	
	(1990–2000)	(2010–2020)
Chaina	150 kg/3,240 sq. ft.	100 kg/3,240 sq. ft.
Thapchini	160 kg/6,480 sq. ft.	150 kg/6,480 sq. ft.
Nan dhan	100 kg/3,240 sq. ft.	50 kg/3,240 sq. ft.
Basmati	100 kg/4,320 sq. ft.	75 kg/4,320 sq. ft.
Hansraj	50 kg/2,160 sq. ft.	-
Sav dhan	75 kg/2,160 sq. ft.	50 kg/2,160 sq. ft.
Laal dhan	100 kg/6,480 sq. ft.	150 kg/6,480 sq. ft.
Taichni dhan	50 kg/2,160 sq. ft.	-
Bakul	50 kg/2,160 sq. ft.	-
Anjan dhan	100 kg/4,320 sq. ft.	40 kg/4,320 sq. ft.
Sunkhori	100 kg/6,480 sq. ft.	70 kg/6,480 sq. ft.
Bauradi	100 kg/2,160 sq. ft.	50 kg/2,160 sq. ft.

cultural heritage, and genetic resource conservation, as traditional rice landraces constitute an irreplaceable reservoir of adaptive traits and indigenous knowledge. If current trends persist, the region risks irreversible genetic erosion, ecological homogenisation, and increased dependency on external seed systems, thereby undermining long-term sustainability and the adaptive capacity of Himalayan agriculture. Despite these constraints, certain varieties, notably *Lal Dhan* and *Thapchini Dhan*, have shown relative resilience and productivity stability, highlighting their adaptive potential under current agro-climatic conditions. The persistence of such varieties underscores the importance of identifying and promoting locally adapted landraces capable of withstanding contemporary agro-climatic stresses.

SUMMARY

The present study was carried out during the rainy (*kharif*) season of 2024 to document the diversity, production trends, and drivers of change affecting traditional rice varieties in the Someshwar valley of Almora district, Uttarakhand. Field-based surveys were conducted across six villages using structured questionnaires and interviews. Twelve traditional rice varieties were recorded, exhibiting distinct ecological adaptability, end-use values, and cultural significance. Comparative production analysis between 1990–2000 and 2010–2020 revealed a substantial decline in the productivity of most varieties, while three varieties were no longer recorded under active cultivation. Conversely, one variety showed a 50% increase in production, while another remained relatively stable. Questionnaire survey analysis identified climate variability, water scarcity, declining soil fertility, increased pest incidence, labour shortages due to rural out-migration, and rising human-wildlife conflict as the primary drivers of these changes. The study highlights the urgent need for integrated conservation strategies to safeguard traditional rice germplasm. These strategies should encompass both *in situ* and *ex situ* conservation approaches, while simultaneously enhancing the ecological resilience and economic sustainability of traditional farming systems. Promoting the cultivation of locally adapted varieties, improving pest and water management techniques, and strengthening extension services through farmer education, training, and incentives are essential components of a sustainable agricultural revitalisation strategy. Additionally, promoting value addition, advancing women's empowerment, and strengthening socio-economic resilience and market access are vital for the comprehensive development of rice-farming communities. By advancing agricultural systems that are both ecologically sustainable and economically viable, it is possible to ensure long-term food security, cultural heritage preservation, and the livelihood resilience of farming communities in the Himalayan region.

REFERENCES

Agnihotri R K, Palni L M S and Pandey D K. 2006. Screening of landraces of rice under cultivation in Kumaun Himalaya for salinity stress during germination and early seedling growth. *Indian Journal of Plant Physiology* **11**(3, NS): 266–72.

Bisht I S, Mehta P S and Bhandari D C. 2007. Traditional crop diversity and its conservation on-farm for sustainable agricultural production in Kumaon Himalaya of Uttaranchal state: A case study. *Genetic Resources and Crop Evolution* **54**: 345–57.

FAO. 1996. *Report on the State of the World's Plant Genetic Resources*. Food and Agriculture Organisation, Rome, Italy.

Jain A. 2018. Analysis of growth and instability in area, production, yield and price of rice in India. *Social Change and Development* **15**(2): 46–66.

Jha A, Singh K M, Meena M and Singh R. 2012. Constraints of rainfed rice production in eastern India: An Overview. http://ssrn.com/abstract=2061953

Khush G S. 1997. Origin, dispersal, cultivation and variation of rice. *Plant Molecular Biology* **35**: 25–34.

Ladha J K, Kumar V, Alam M M, Sharma S, Gathala M, Chandna P, Saharwat Y and Balasubramanian V. 2009. Integrating crop and resource management technologies for enhanced productivity, profitability, and sustainability of the rice–wheat system in South Asia. *Integrated Crop and Resource Management in the Rice–Wheat System of South Asia* 69–108.

Mahajan G, Kumar V and Chauhan B S. 2017. Rice production in India. *Rice Production Worldwide* 53–91.

Mahajan G, Singh K and Gill M S. 2012. Scope for enhancing and sustaining rice productivity in Punjab (Food bowl of India). *African Journal of Agricultural Research* **7**: 5611–20.

Maikhuri R K, Rao K S and Semwal R L. 2001. Changing scenario of Himalayan agro-ecosystems: Loss of agro-biodiversity, an indicator of environmental change in Central Himalaya, India. *Environmentalist* **21**(1): 23–39.

Mehta P S, Negi K S and Sharma A K. 2008. Traditional rice landraces of district Bageshwar, Uttarakhand and their conservation. *Indian Journal of Plant Genetic Resources* **21**(1): 63–67.

Mehta P S, Ojha S N, Negi K S, Verma S K, Rayal A and Tyagi R K. 2014. On-farm status of rice (*Oryza sativa* L.) genetic resources in Garhwal Himalaya of Uttarakhand, India. *Genetic Resources and Crop Evolution* **61**: 1279–94.

Mohapatra T, Nayak A K, Raja R and Shahid M. 2013. *Vision 2050*. ICAR-Central Rice Research Institute, Cuttack.

Pasalu I C, Mishra B, Krishnaiah N V and Katti G. 2004. Integrated pest management in rice in India: Status and prospects. *(In) Proceedings,* Vol. 11, pp. 237–45.

Patra B C and Dhua S R. 2003. Agro-morphological diversity scenario in upland rice germplasm of Jeypore tract. *Genetic Resources and Crop Evolution* **50**(8): 825–28.

Phenica B A, Lakshmi T, Prasad S V and Ramu Y R. 2018. A study on production constraints of rice cultivation in Kurnool district of Andhra Pradesh and suggestions to overcome them. *International Journal of Current Microbiology and Applied Science* **7**(11): 2364–68.

Prasad R, Shivay Y S and Kumar D. 2017. Current status, challenges, and opportunities in rice production. *Rice production worldwide* 1–32.

Rana J C, Negi K S, Wani S A, Saxena S, Pradheep K, Kak A, Pareek S K and Sofi P A. 2009. Genetic resources of rice in the Western Himalayan region of India: Current status. *Genetic Resources and Crop Evolution* **56**(7): 963–73.

Rana J C, Sharma B D and Gautam P L. 2000. Agri-diversity erosion in the north-west Indian Himalayas- Some case studies. *Indian Journal of Plant Genetic Resources* **13**(03): 252–58.

Singh K M, Jha A, Meena M and Singh R. 2012. Constraints of rainfed rice production in India: An overview. *Innovations in Rice Production*, pp. 71–84. Shetty P K, Hegde M R and Mahadevappa M (Eds). National Institute of Advance Studies, Indian Institute of Science Campus, Bengaluru.

Singh S R K, Gautam U S, Shukla S K, Singh D K and Pandey S K. 2010. Improved rice production technologies in Uttarakhand hills: Inquisitiveness, reversion, adoption and constraints. *Indian Journal of Extension Education* **46**(1 and 2): 127–31.

Thanh N C and Singh B. 2006. Constraints faced by the farmers in rice production and export. *Omonrice* **14**: 97–110.