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Organic Farming in Uttarakhand: Trends and Prospects

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ABSTRACT

Organic agriculture has emerged as a sustainable alternative for achieving environmental, social, and economic goals, particularly in fragile ecosystems such as the Himalayan region. Uttarakhand, the first state in India to be declared organic, provides an important case for understanding the growth and challenges of organic farming. This study examines the opportunities, trends, and prospects of organic farming in Uttarakhand in the context of global and national developments. The analysis is based on secondary data collected from government reports, statistical handbooks, and records of the Uttarakhand Organic Commodity Board (UOCB), APEDA, and FiBL-IFOAM. The findings reveal that at the global level, the area under organic farming expanded from 14.9 million hectares in 2000 to 96.4 million hectares in 2020, reflecting a remarkable 547% increase over two decades. At the national level, India's organic farming area grew by 104.8% between 2016–17 and 2021–22. In Uttarakhand, the area under organic cultivation increased from 24,195 hectares in 2007–08 to 225,252 hectares in 2023–24, representing an 831% rise. Likewise, over the last decade (2015–16 to 2023–24), the area expanded from 27,224.34 hectares to 225,252.96 hectares, marking a 727.4% increase. This substantial growth has been largely driven by targeted government interventions, including the Paramparagat Krishi Vikas Yojana (PKVY), Rashtriya Krishi Vikas Yojana (RKVY), and the Namami Gange Programme. The study concludes that while Uttarakhand has made notable progress in expanding organic farming, the state continues to hold immense untapped potential given its locational advantages, minimal use of agrochemicals, and targeted policy support. However, challenges remain in the form of weak marketing linkages, low productivity, limited price premiums for organic products, and inadequate supply of organic inputs and skilled labor.

Keywords: Organic farming, PKVY, RKVY, Namami Gange Programme

INTRODUCTION

Organic agriculture has become a recognisable movement for farming all around the world, driven by the impacts of conventional farming, the risks of chemical inputs, and the worry of chemicals in the food and its sustainability in the long term. It tries to preserve the environment by farming without the use of chemicals and pest controls, and genetically modified organisms. It uses animal waste, green manure, and crop rotation as well as other natural pest controls (IFOAM, 2005). Organic agriculture decreases the use of chemicals and synthetic fertilizers, which in many cases lead to a number of environmental issues such as soil erosion, water pollution, and even the loss of biodiversity (Pimentel *et al.,* 2005). By nourishing the soil, organic agriculture enhances the adaptive capacity of agricultural systems to environmental challenges such as drought, floods, and pest attacks. This is vitally significant in relation to climate change as such events are increasing in occurrence and becoming escalated (Scialabba and Müller-Lindenlauf, 2010). Organic agriculture is one of multiple production methods that are environmentally sustainable. Organic production systems are responsive to the increasing demand. This includes about 4.48 million hectares of farmland used for growing crops and another 2.85 million hectares for collecting wild harvests (APEDA, 2024). States like Madhya Pradesh, Rajasthan, Maharashtra,

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and Uttarakhand are leading in organic farming adoption, with a focus on key export crops like tea, coffee, spices, and medicinal plants. Uttarakhand is one of the leading states in India for organic farming, with a focus on traditional integrated agricultural livestock production and an ecologically sound environment. Most traditional hill agriculture in Uttarakhand is managed organically by default because farmers have limited access to agrochemicals and experience poor crop responses to chemical fertilizers in rainfed areas (Maikhuri *et al.*, 2015). 40% of the farmers in the state scored high on the trust scale, indicating that they have a generally positive opinion about organic farming. They acknowledge the benefits such as sustainable development, safe food and fertile land, but they still do not have adequate information about certification processes and input requirements. To promote the adoption of organic farming, the study highlights the importance of training, awareness campaigns and reliable market support (Singh and George, 2012). Uttarakhand's natural conditions low fertilizer use, traditional compost manure, and agro-biodiversityprovide a solid foundation for organic farming. However, productivity constraints, certification barriers, and weak market infrstructures limit growth, highlighting the need for strong institutional support and policy interventions to harness the export and domestic potential of traditional crops such as millets, pulses, and basmati rice (Saxena *et al.,* 2023). The present study aims to examine the trends in organic farming practices in Uttarakhand and evaluate the prospects of organic farming, particularly its potential contribution to sustainable agriculture.

METHODOLOGY

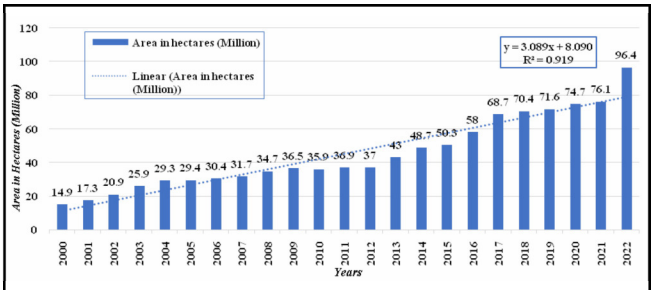
The present study, which focused on Uttarakhand, relies on secondary data meticulously gathered from a wide range of credible sources. A detailed review of existing literature was conducted, including government publications and historical records, along with a detailed analysis of the relevant information. We obtained secondary data from well-known organizations such as the International Federation of Organic Agriculture Movements (IFOAM), the Research Institute of Organic Agriculture (FiBL), and the Agricultural and Processed Food Products Export Development Authority (APEDA). We also used official records from the Uttarakhand Organic Commodity Board (UOCB), the Directorate of Agriculture, Uttarakhand, and related government websites to ensure the data's accuracy and reliability.

RESULTS AND DISCUSSION

The Global Trends in Organic Farming:

Organic farming has gained significant momentum globally in the last few decades due to growing awareness towards environmental sustainability, health consciousness, and demand for chemical-free food products (Rahman *et al.,* 2024). The global demand for organic food and beverages is growing as consumers prefer healthier and more environmentally friendly options. This trend is particularly prominent in developed countries, such as the United States and European countries, as well as emerging economies such as India and China (Willer *et al.,* 2023). Organic agriculture is currently practiced in 188 countries around the world, with more than 96 million hectares of agricultural land managed according to organic principles. This widespread practice is carried out by at least 4.5 million farmers worldwide. The organic sector has seen significant economic growth, with global sales of organic food and beverages reaching nearly 135 billion euros in 2022 (Willer *et al.*, 2024). This reflects a steady increase in consumer demand for organic products driven by growing concerns over environmental sustainability, health, and food safety.

The Fig. 1 shows the global growth of organic agricultural land between 2000–2022. In 2000, there were 14.9 million hectares in organic land area that persistently grew and ended up at about 96.4 million hectares in 2022. This is over 6 times greater than two decades ago and highlights the growth of organic agriculture, which has been a steady and increasing trend. The trend line ($y = 3.0892x + 8.0901$; $R^2 = 0.919$) provides a very high positive correlation, and shows that the expansion is nearly linear, as approximately 3.1 million hectares were added



Source: FiBL-IFOAM-SOEL Surveys 2001-2022

Fig. 1 : World: Growth of The Organic Agricultural Land and Organic Share 2000-2022

each year on average. The high R^2 value of 0.919 implies that the model explains most of the variability in the data, suggesting a credible trend. Therefore, there are a number of growth-phase observations here. Organic land area grew in a steady but gradual way from 2000–2008 and crossed 34.7 million hectares. The years 2009–2014 witnessed a decline in growth; in 2015, renewed expansion occurred and increased substantially in 2017 (68.7 million hectares), after crossing 34.7 million this past decade. Between 2017–2022, still further increases, distilling the land area graphically, may identify a number of phases and overall increasing trend.

Organic Farming in India:

India is one of the world's leading countries in organic farming with its vast agricultural diversity and growing shift towards sustainable practices. The country has seen significant growth in organic farming over the past two decades, driven by rising consumer demand for chemical-free food, government initiatives, and awareness of environmental sustainability. As per the latest available data, India ranks 2nd in the world in terms of organic agricultural land and 1st in terms of the total number of organic producers (FiBL and IFOAM Yearbook, 2024). As of 31 March 2024, the total area under the organic certification process (registered under the National Programme for Organic Production - NPOP) is 7.3 million hectares (2023-24). This includes 4,475,836.91 hectares of cultivable area and 2,850,156.48 hectares of area designated for wild harvest collection (Yes Bank and APEDA, 2024). Among all of the states, Madhya Pradesh has the largest area under organic certification, followed by Maharashtra, Rajasthan, Gujarat, Odisha, Sikkim, Uttar Pradesh, Uttarakhand, Kerala, Karnataka, and Andhra Pradesh.

The Table 1 shows the total area undergoing the organic certification process in India over the last six years, from 2016 to 2022. This includes both cultivated and wild harvest lands. The data presents that the overall area under certification fluctuated in the earlier years but saw a significant increase in 2021-22. The total area was about 4.45 million hectares in 2016-17. It then dropped to 3.42 million hectares in 2018-19, but later rose again to over 4.33 million hectares in 2020-21. The most notable increase happened in 2021-22, when the certified area more than doubled to 9.11 million hectares. This signals a rapid growth of organic farming in the country. At the state level, Madhya Pradesh has consistently been the leader in the area under organic certification. It started with over 2.29 million hectares in 2016-17. The state experienced fluctuations in the following years but peaked at 2.37 million hectares in 2021-22, contributing significantly to the national total. Rajasthan also maintained a strong position, with its area ranging from 539,522 hectares in 2016-17 to 686,421 hectares in 2021-22. Similarly, Maharashtra showed steady growth, expanding from around 292,391 hectares in 2016-17 to over 1.13 million hectares in 2021-22. Gujarat also made significant strides, especially in 2021-22, when its certified area jumped to over 602,248 hectares from 70,495 hectares in 2016-17. Himachal Pradesh showed a unique pattern, with its area under certification rising significantly in 2017-18 before stabilizing at about 200,000 hectares. States like Karnataka, Odisha, and Uttarakhand also experienced growth over the years. Odisha surpassed 184,000 hectares in 2021-22, while Karnataka maintained over 100,000 hectares. Notably, Chhattisgarh saw extraordinary growth, with its certified area soaring from about 179,752 hectares in 2016-17 to over 3 million hectares in 2021-22, making it one of the standout states for rapid growth. In contrast, some states, like Assam, Arunachal Pradesh, and Kerala, had only moderate changes without significant expansion. Others, like Jammu and Kashmir, saw a decline in later years, dropping from over 215,000 hectares in 2019-20 to just 59,826 hectares in 2021-22. North-eastern states like Meghalaya, Mizoram, and Nagaland showed small but steady increases in their certified area, although their overall contribution to the national total remains relatively modest. Sikkim, already declared an organic state, kept its certified area at around 75,000 hectares consistently over the six years, reflecting stability rather than growth. India's organic sector is experiencing rapid expansion, particularly in states like Chhattisgarh, Madhya Pradesh, Maharashtra, Gujarat, and Rajasthan. The year 2021-22 serves as a pivotal moment when organic certification expanded significantly, nearly doubling the total area compared to the previous year. This trend reflects increasing awareness, government support, and market demand for organic products, indicating that India is steadily progressing toward becoming a global leader in organic farming.

Trends and Prospects of Organic Farming in Uttarakhand:

Organic farming in Uttarakhand has witnessed a

Table 1 : Total Area Under Organic Certification Process During Last 6 Years (Cultivated + Wild Harvest) (In Ha)

Sr. No.	State Name	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
1.	Andaman & Nicobar Islands	0.00	0.00	7484.00	7484.00	0.00	155.00
2.	Andhra Pradesh	172783.03	184748.65	37409.72	42101.87	36801.36	49638.42
3.	Arunachal Pradesh	72311.27	6179.69	9246.94	10657.66	13114.12	12636.64
4.	Assam	23930.40	28071.81	28234.67	26753.67	18470.84	18102.94
5.	Bihar	679.20	695.80	3519.51	22712.55	29902.54	30941.01
6.	Chhattisgarh	179752.14	191464.66	206180.71	208392.80	286684.52	3008606.33
7.	Goa	15762.43	15698.98	20964.80	20786.66	18222.16	18259.72
8.	Gujarat	70495.05	85400.71	94708.69	95207.58	147866.41	602248.50
9.	Haryana	5031.76	6912.40	5998.58	6155.75	4903.06	3198.95
10.	Himachal Pradesh	14376.72	170153.47	203847.50	204836.35	203736.47	203043.02
11.	Jammu & Kashmir	181608.32	180870.34	187002.89	215275.95	192769.82	59825.58
12.	Jharkhand	36813.95	51187.93	58116.87	64254.18	81661.70	58970.14
13.	Karnataka	81948.81	105515.02	104962.37	170418.49	174423.56	110703.45
14.	Kerala	43701.88	34160.14	40911.24	47575.29	48364.18	43681.54
15.	Ladakh	0.00	0.00	0.00	64.22	817.85	7817.85
16.	Lakshadweep	895.52	895.51	895.51	895.51	895.51	895.51
17.	Madhya Pradesh	2292697.39	1156881.40	918303.08	1161015.03	1637730.46	2370593.41
18.	Maharashtra	292391.78	304074.81	261571.74	293135.19	371798.28	1133668.57
19.	Manipur	241.40	5397.90	7460.82	14990.07	14724.92	14628.42
20.	Meghalaya	9629.60	40335.66	48409.74	45382.40	38376.39	27508.74
21.	Mizoram	210.00	998.95	7039.89	10029.89	13038.89	19038.89
22.	Nagaland	4699.93	8839.86	8268.56	14254.97	14790.38	14269.27
23.	New Delhi	9.23	9.23	0.72	0.72	5.17	12.95
24.	Odisha	99736.17	117910.30	127851.77	115676.68	96306.88	184034.35
25.	Pondicherry	2.84	2.84	2.84	23.65	23.65	21.51
26.	Punjab	17648.53	18000.77	25524.58	25637.95	18637.50	24180.60
27.	Rajasthan	539522.12	442133.72	632701.23	539245.81	481862.38	686420.61
28.	Sikkim	75218.28	76076.18	75798.92	75717.65	75729.66	75475.28
29.	Tamil Nadu	10775.69	20070.51	26546.83	36766.59	41618.86	53388.22
30.	Telangana	9687.84	8919.82	8759.52	8742.28	6865.56	39200.47
31.	Tripura	203.56	2251.19	2534.52	3539.18	6521.31	12081.63
32.	Uttar Pradesh	101459.95	192734.40	205980.82	132031.67	159307.73	115590.47
33.	Uttarakhand	93586.42	104134.66	41409.55	43647.02	82210.20	113747.54
34.	West Bengal	5176.03	5811.48	20989.65	6392.05	21002.61	7280.37
	Total	4452987.240	3566538.790	3428638.780	3669801.330	4339184.930	9119865.91

Source : APEDA, 2024

steady expansion over the past two decades, supported by the state's unique agro-ecological system, low use of chemical fertilizers in the hill districts and consumers increasing desire for safe and sustainable food. The governments continuous efforts, combined with growing consumer demand have further accelerated this change. Examining the trends in the total area under organic farming and the number of registered organic farmers provides an important perspective on the effectiveness of policies and schemes implemented to promote organic farming. In this context, the following analysis presents the growth pattern of organic farming in Uttarakhand, as shown in Table 2 and Table 3, which show the changes in area and farmers' participation during the study period.

The Table 2 on the trends of organic farming area in Uttarakhand from 2007 to 2023 shows both ups and downs, as well as periods of strong growth in the state's journey with organic farming. In the early years, from 2007-08 to 2010-11, the area used for organic farming grew steadily, increasing from 24,195 hectares to 61,803 hectares. This growth included significant annual increases, such as +58.5% in 2009-10 and +36.9% in 2010-11. However, this growth was not maintained. Between 2011-12 and 2013-14, the area fell sharply. The total area dropped drastically from 61,803 hectares in 2010-11 to just 26,456 hectares in 2013-14, showing

Table 2 : Trends of Organic Farming Area in Uttarakhand (2007–2024)

Year	Total area (Hectare)	% Change from Previous Year
2007-08	24,195.02	-
2008-09	28,480.00	+17.7%
2009-10	45,144.44	+58.5%
2010-11	61,803.00	+36.9%
2011-12	45,499.00	-26.4%
2012-13	38,148.16	-16.2%
2013-14	26,456.00	-30.6%
2014-15	27,224.34	+2.9%
2015-16	26,496.42	-2.7%
2016-17	33,565.55	+26.7%
2017-18	35,105.55	+4.6%
2018-19	124,365.00	+254.3%
2019-20	154,226.00	+24.0%
2020-21	217,029.52	+40.7%
2021-22	220,977.00	+1.8%
2022-23	221,078.00	+0.0%
2023-24	225,252.96	+1.9%

Source: UOCB and Directorate of Agriculture, Uttarakhand

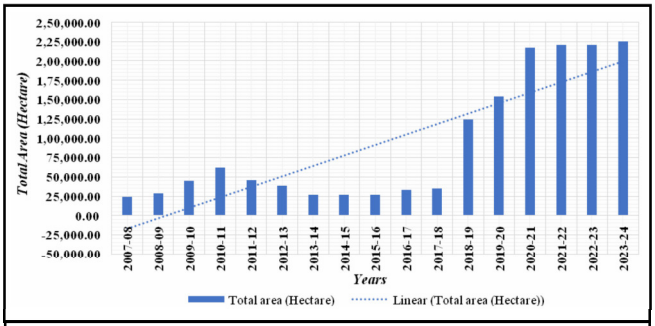


Fig. 2 : Trends of Organic Farming Area in Uttarakhand (2007–2024)

consecutive negative growth rates. The sharpest decline was –30.6% in 2013-14. In 2014-15, a slight recovery occurred with a small growth of +2.9%, but this was followed by another slight decline in 2015-16. The situation improved in 2016-17 when the state saw a healthy growth rate of +26.7%, raising the certified area to 33,565 hectares. This upward trend persisted into 2017-18 with modest growth. The most significant increase happened in 2018-19. That year, the total organic farming area soared from 35,105 hectares to 124,365 hectares, marking a remarkable growth of +254.3%. From 2018-19 onward, the organic farming area kept growing, reaching 154,226 hectares in 2019-20 and 217,029 hectares in 2020-21, showing consistent double-digit growth. Although the growth rate slowed in 2021-22 and 2022-23, with small changes of +1.8% and 0.0%, respectively, this indicates that the state had stabilized its certified organic area. By 2023-24, the total certified area was 225,252 hectares, reflecting modest but steady growth from the previous year. Table 2 presents that organic farming in Uttarakhand has gone through three clear phases: an initial growth period (2007-2010), a time of decline and stagnation (2011-2015), and finally a phase of rapid growth and consolidation since 2016. The surge after 2018-19 especially indicates the success of renewed efforts, suggesting that organic farming has become an important part of the state's agricultural strategy.

Table 3 presents the trend in the number of organic farmers in Uttarakhand during the period 2007-08 to 2021-22.

Table 3 : Trends of Organic Farmers in Uttarakhand (2007–2022)

Year	Total Farmers	Change (No.)	Change (%)
2007-08	44,000	–	–
2008-09	50,689	+6,689	+15.2
2009-10	70,000	+19,311	+38.1
2010-11	99,527	+29,527	+42.2
2011-12	57,144	–42,383	–42.6
2012-13	61,643	+4,499	+7.9
2013-14	42,691	–18,952	–30.7
2014-15	40,902	–1,789	–4.2
2015-16	53,216	+12,314	+30.1
2016-17	71,762	+18,546	+34.9
2017-18	75,612	+3,850	+5.4
2018-19	287,906	+212,294	+280.8
2019-20	427,162	+139,256	+48.4
2020-21	476,350	+49,188	+11.5
2021-22	493,850	+17,500	+3.7

Source: UOCB and Directorate of Agriculture, Uttarakhand

The data show a fluctuating but overall upward trend, with the number of registered organic farmers increasing more than eleven-fold between 2007-08 and 2021-22.In the initial years, from 2007-08 to 2010-11, the number of organic farmers grew steadily, increasing from 44,000 to 99,527, reflecting the initial impact of state-level incentives and farmer awareness initiatives. However, the period between 2011-12 and 2014-15 saw a significant decline, and by 2014-15 the number of farmers fell sharply to just 40,902. A period of recovery began in 2015-16, when the number of farmers once again saw a steady increase, reaching 75,612 by 2017-18. This phase of stabilisation was followed by significant growth in 2018-19 and 2019-20, when the number of farmers increased

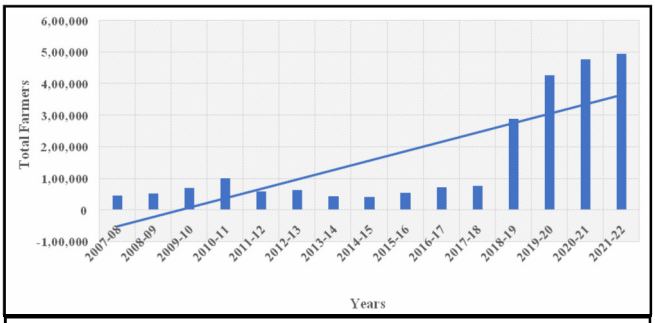


Fig. 3 : Trends of Organic Farmers in Uttarakhand (2007–2022)

dramatically from 75,612 to 287,906 and then to 427,162. In the most recent years, 2020-21 and 2021-22, the growth rate slowed, with the number of farmers falling to 476,350 and 493,850, respectively.

As we can see in Table 2 and Table 3, both the total area under organic farming and the number of registered farmers have shown a steady increase since 2014-15. This strong and sustained growth can be attributed to the adoption of cluster-based organic farming in Uttarakhand, implemented through centrally sponsored schemes such as the Paramparagat Krishi Vikas Yojana (PKVY) launched in 2015, RKVY-RAFTAAR in 2017-18 and Namami Gange in 2017-18, managed by multiple departments including the Department of Agriculture, Horticulture and Silk. A major milestone was the enactment of the Uttarakhand Organic Agriculture Act (2019), the first legislation of its kind in India, which institutionalised the state's organic approach and strengthened its aspiration to become the "organic capital" of the country. Collectively, these policy interventions, legal measures and social changes have fuelled the long-term growth of organic farming in the state.

Uttarakhand is now maintaining a stable and significant area under organic certification. Currently, organic farming is being done on 2,26,540 hectares of land, with 4,80,350 farmers growing 60 different crops, accounting for 36% of the state's total agricultural area (Singh and Gupta, 2024). This significant expansion underlines the effectiveness of policy interventions, rising market demand, and farmers' growing commitment to sustainable agricultural practices.

Government Schemes and Their Role in Expansion:

Uttarakhand has embraced cluster-based organic farming, implemented through various centrally sponsored schemes such as *Paramparagat Krishi Vikas Yojana* (PKVY), *Rashtriya Krishi Vikas Yojana* (RKVY), *Namami Gange*, and Natural Farming. These initiatives are managed by departments like Agriculture, Horticulture, and the Silk Department. Additionally, the state government has promoted organic farming through state-level programs such as the *Deendayal Upadhyay Sahkarita Kisan Kalyan Yojana*, the Uttarakhand Start-up Policy (2018), and the enactment of the Organic Agriculture Act, 2019 (Singh and Gupta, 2024). These policies aim to strengthen farmer cooperatives, support organic startups, and provide a legal framework to regulate and promote organic farming practices in the state.

Rashtriya Krishi Vikas Yojna (RKVY):

Launched in 2007, RKVY supports the development of agriculture by encouraging states to increase public investment. It offers financial help for third-party certification of organic farming. In 2019 to 2020, the Uttarakhand Organic Commodity Board (UOCB) certified 62,000 hectares with 125,000 farmers following NPOP and NOP standards.

Paramparagat Krishi Vikas Yojana (PKVY):

The Paramparagat Krishi Vikas Yojana (PKVY), launched in 2015 and 2016, promotes organic farming through a cluster-based approach and PGS-India certification. During the first phase, from 2015 to 2018, the scheme operated in 11 hilly districts, covering 11,700 hectares across 585 clusters. In the second phase, from 2018 to 2023, it grew to 3,900 clusters and covered 78,000 hectares, further increasing organic farming adoption in the region. In 2018 to 2019, Rs. 13,127.40 lakh was fully used, and in 2021 to 2022, Rs. 3,316.11 lakh was set aside for the third phase.

Swachhta Action Plan under the 'Namami Gange Campaign':

The Namami Gange Project in Uttarakhand aims to cut pollution along the Ganga River by promoting organic farming in riverbank areas. From 2017 to 2020, the program was active in 5 districts, such as Tehri, Chamoli, Rudraprayag, Uttarkashi, and Pauri, covering 42 villages across 840 hectares. In the second phase, from 2020 to 2023, it expanded to 7 districts, Haridwar, Dehradun, Tehri, Chamoli, Rudraprayag, Uttarkashi, and Pauri, covering 1,182 villages over 50,000 hectares,

further promoting organic farming practices.

National Mission on Natural Farming:

The National Mission on Natural Farming (NMNF) is an important initiative by the Government of India to encourage natural and organic farming throughout the country. In Uttarakhand, the mission is being implemented in 11 districts, covering 6,400 hectares from 2022 to 2026, with funding from the central government. The program aims to lower farming costs, increase farmers' income, and promote zero-cost natural farming by avoiding fertilizers, pesticides, and intensive irrigation. This approach helps conserve soil health and protect the environment.

Prospect of organic farming in Uttarakhand:

Agriculture in the Uttarakhand Himalaya, despite being spatially limited, remains crucial to local livelihoods, where traditional farming practices are largely organic by default due to limited access to agrochemicals, reliance on farmyard manure, and adaptive cropping systems (Mittal *et al.,* 2008). The region enjoys locational advantages, including minimal agrochemical use compared to neighbouring states and a strong export market for organically grown crops such as basmati rice, ragi, and medicinal plants. Rich forest cover and abundant water resources support organic farming inputs, while cultural practices ensure sustainable use of forest resources. However, small land holdings and migration pose challenges to profitability and long-term sustainability. Tourism, driven by religious sites, beautiful landscapes, and biodiversity, offers significant potential to promote and market organic products, potentially preventing migration and promoting ecological conservation (Maikhuri *et al.*, 2015). The primary objective of promoting organic farming is to enhance crop productivity, improve soil health, and increase the value of agricultural produce, ultimately boosting farmers' incomes. Organic products have a distinct and growing market, which, if strategically tapped, can drive significant economic development in these hill districts. The challenging terrain and poor road connectivity in the region make chemical fertilizers both scarce and costly, encouraging a natural shift towards organic farming practices. Notably, Uttarakhand holds the distinction of being the first state in India to be officially declared an organic state (Mittal *et al.*, 2008). There is significant potential for organic farming in Uttarakhand due to the government's extensive promotional efforts through UOCB and the growing demand for safe food among urban consumers. However, sustainability may be threatened by issues with long-term productivity and a lack of broader acceptance (Maji and Meena, 2017).Traditional seed preservation methods such as plastering storage containers with cow dung and mud, coating seeds with ash, and using plant leaves as pesticides are widely practised in Uttarakhand. These eco-friendly methods not only provide sustainable alternatives to chemical pesticides but also help conserve genetic resources and strengthen the sustainability of organic farming in the region (Mehta *et al.,* 2012). With strong government incentives, premium markets, and traditional composting practices, Uttarakhand is strategically moving towards becoming India's first organic state, particularly through a cluster-based approach focused on crops such as mandua (finger millet), jhangora (barnyard millet), gahat (horse gram), and rajma (kidney beans) (SAP, 2017). Organic farming has also been identified as a key driver in the Uttarakhand Vision 2030 plan, which emphasizes on promoting farmer producer organizations and cluster-based approaches along with strengthening certification, marketing and export linkages. Special focus has been given to high-value crops and traditional millets, which are expected to generate significant domestic and international market opportunities, improving rural livelihoods and ecological sustainability (Government of Uttarakhand, 2018). However, despite these advantages, organic farming in the hilly regions of Uttarakhand faces several constraints, including low farm-gate prices, yield losses, high certification costs, lack of specialisedmarkets, inadequate infrastructure, shortage of high quality inputs, and ecological issues such as erratic rainfall and pest infestation. These constraints reduce farmer incentives and impede the growth of organic farming, despite its enormous ecological potential (Haneef *et al.*, 2019).

Favourable Agro-Climatic Conditions:

Uttarakhand's diverse agro-climatic zones, ranging from subtropical to alpine, create ideal conditions for cultivating a wide range of organic crops. Crops such as millets, pulses, medicinal plants, and high-value horticultural produce thrive in the region. This agro-climatic diversity not only allows farmers to meet domestic and international market demands but also facilitates the adoption of sustainable practices such as crop rotation and mixed farming, which are essential for maintaining

Table 4 : Crops Identified for Different Regions in Uttarakhand

Sr. No.	Agro-Climatic Zone (Altitude Range)	Area Characteristics	Major Agricultural and Horticultural Diversity
1.	Zone A (Tropical Zone, up to 1000 m)	Plains, Terai, Shivalik Hills, and Valleys	Paddy, wheat, sugarcane, maize, pulses, oilseeds, mango, litchi
2.	Zone B (Subtropical Zone, 1000–1500 m)	Lower and mid-hills, largely unirrigated	Paddy, wheat, ragi, pulses
3.	Zone C (Cool Temperate Zone, 1500–2400 m)	Mid- to high-altitude regions	Wheat, barley, potato, maize, pulses, temperate fruits (apple, pear, plum, peach)
4.	Zone D (Sub-alpine and Alpine Zone, above 2400 m)	Upper Himalayan regions, alpine meadows (bugyals)	Limited kharif crops, horticulture, floriculture, medicinal and aromatic plants, pastures, rare herbs, pine

Source: (RKVY, GoI, 2017)

soil fertility and enhancing long-term agricultural productivity.

Zone A (tropical zone, up to 1000 m):

This region,located in the southern and western parts of the state, this region comprises the plains, Terai, and Shivalik hills of districts like Haridwar, Udham Singh Nagar, Dehradun (lower areas), and parts of Nainital and Pauri Garhwal. It is characterised by fertile alluvial soil and comparatively better irrigation facilities, making it the most productive agricultural region of Uttarakhand. A variety of food and cash crops, including paddy, wheat, sugarcane, maize, pulses, and oilseeds, are grown here. In addition, horticultural crops like mango and litchi are also grown on a large scale, making the region important for both subsistence-based farming and market-oriented agriculture.

Zone B (Subtropical Zone, 1000–1500 m):

The Zone is spread across the lower and mid-hill regions of districts like Tehri Garhwal, Pauri Garhwal, Almora, Champawat, and parts of Nainital and Pithoragarh. Agriculture is mainly rain-fed, and irrigation facilities are limited. Major crops include paddy, wheat, ragi, and pulses, which are cultivated mainly under subsistence farming systems. The dependence on non-irrigated farms makes agricultural productivity in the region more vulnerable to climate change.

Zone C (Cool Temperate Zone, 1500-2400 m):

Spread across the mid to high altitudes of Chamoli, Uttarkashi, Rudraprayag, Pithoragarh, Almora, and parts of Tehri and Pauri Garhwal, this zone is ecologically suitable for temperate cereals, tubers, and fruits. Major crops include wheat, barley, potato, maize, and pulses, while horticultural production is dominated by temperate fruits such as apple, pear, plum, and peach. This zone offers a clear comparative advantage in high-value horticulture, which has the potential to significantly increase farmers' incomes with adequate facilities for storage, processing, and market linkages.

Zone D (Sub-alpine and Alpine zone, above 2400 m):

Located in the higher Himalayan districts of Chamoli, Uttarkashi, Pithoragarh, and parts of Rudraprayag and Bageshwar, this zone is marked by harsh climatic conditions, short seasons, and extensive alpine meadows (Bugyals). Although crop cultivation is limited here, the region is highly suitable for horticulture, floriculture, and the cultivation of medicinal and aromatic plants. It is also rich in rare herbs and natural pastures that form the basis of livestock-based livelihoods. Additionally, forest resources such as pine contribute to both the ecological stability and economic potential of this zone.

The Tradition of Organic Farming by Default:

Organic farming in Uttarakhand is deeply rooted in traditional agricultural practices, which have been followed by local farmers for generations. Historically, farming in the region has relied on natural resources, with minimal use of chemical fertilizers or pesticides due to limited accessibility and the high cost of synthetic inputs. The hill farming communities have traditionally practiced mixed cropping, crop rotation, and the use of farmyard manure, which align closely with modern organic farming principles. Notably, approximately 80% of farming in Uttarakhand is considered 'organic by default' due to the minimal use of agrochemicals, particularly in rainfed and hilly terrains, highlighting the region's inherent suitability for sustainable organic agriculture (Maikhuri *et al.,* 2015; Nicolaysen *et al.,* 2014). Traditional knowledge systems in Uttarakhand, passed down through generations, emphasize biodiversity, soil health, and

natural pest control. Crops such as millets, pulses, and indigenous rice varieties have been cultivated organically, preserving soil fertility and ecological balance (Kheya *et al.,* 2023). Livestock integration further supports these practices by providing organic manure, reducing reliance on external inputs. This historical reliance on organic practices has given Uttarakhand a unique advantage in transitioning to certified organic farming systems. The cultural and spiritual significance of living in harmony with nature also plays a key role in shaping farmers' attitudes towards organic agriculture.

High Existing Coverage of Organic Farming:

Currently, approximately 2.26 lakh hectares of agricultural land in Uttarakhand is under organic cultivation, accounting for about 36% of the state's total agricultural area. This represents one of the highest adoption rates of organic farming in the country. According to a 2024 report by Yes Bank, Uttarakhand ranks 6th in terms of area under organic certification and 9th in terms of total organic production, reflecting both extensive adoption and growing productivity. Uttarakhand leads the nation in terms of the highest number of registered organic farmers, as per data from the Jaivik Kheti portal. This widespread farmer participation underscores the state's potential to further scale up organic agriculture through targeted policies and support mechanisms.

This data shows the potential for extensive institutional participation and market-based growth for organic farming in Uttarakhand. The state's prominence in terms of farmer registration not only validates its active participation but also strengthens its claim as a model state for organic farming in India.

Table 5 : Top 10 States by Number of Registered Organic Farmers

Rank	State	Registered Organic Farmers
1	Uttarakhand	2,17,769
2	Uttar Pradesh	1,05,888
3	Madhya Pradesh	47,434
4	Rajasthan	40,313
5	Maharashtra	39,279
6	Odisha	31,478
7	Chhattisgarh	27,777
8	Bihar	18,256
9	Jharkhand	17,744
10	Kerala	14,781

Source: Jaivikkheti Portal. Government of India

Growing Market Demand :

Post-COVID-19, there has been a noticeable surge in consumer preference for organic products, driven by increased health awareness and the demand for chemical-free food. Uttarakhand, with its reputation for pristine agriculture, is well-positioned to tap into national and global organic markets. Uttarakhand is endowed with abundant natural resources and holds significant export potential in sectors such as organic agricultural products, agro-based and processed foods, aromatic and medicinal plant-based products, pharmaceuticals, nutraceuticals, and service industries like tourism and wellness (Uttarakhand Export Policy, 2021).

Table 6 shows the trends in the sale value of organic commodities over the years from 2016-17 to 2022-23 (estimated). There was a consistent increase in sales from Rs. 1213.09 Lakhs in 2016-17 to Rs. 1425.09 Lakhs in 2018-19, reflecting a steady growth in the market for organic commodities. However, in 2019-20, the value declined to Rs. 1179.17 Lakhs, which could be attributed to several external factors such as market conditions or supply chain disruptions. The following year, 2020-21, saw a sharp rebound to Rs. 1512.09 Lakhs, possibly driven by a surge in demand for organic products during the COVID-19 pandemic as consumers became more health-conscious. Despite a slight dip in 2021-22 to Rs. 1423.00 Lakhs, the sales value remained relatively strong, and the estimated value for 2022-23 at Rs. 1462.00 Lakhs suggests continued growth.

Table 6 : Organic Produce Marketed in Uttarakhand (2016-2023)

Year	Value of sale of organic commodities (Rs. in Lacs)
2016-17	1213.09
2017-18	1389.00
2018-19	1425.09
2019-20	1179.17
2020-21	1512.09
2021-22	1423.00
2022-23 (Estimated)	1462.00

Source: UOCB and Directorate of Agriculture, Uttarakhand

Export Potential for High-Value Crops:

Uttarakhand has demonstrated significant potential in the export of high-value organic crops. In the year 2022–23, the state exported approximately 97 metric tonnes of organic produce valued at Rs. 4.2 crore (USD 0.5 million). These exports were directed to premium international markets including Australia, the European

Union, Malaysia, Switzerland, the UAE, and the USA. The key export commodities (by value) included essential oils, freeze-dried spices, and medicinal plant products such as basil and lemongrass oil, along with pulses and cereals like Sona Masoori and non-basmati rice (Yes Bank, 2024).

Strong Governmental Support and Policy Backing:

Organic farming in Uttarakhand has received robust support through a range of central and state-sponsored initiatives. Key national schemes such as the Paramparagat Krishi Vikas Yojana (PKVY), Namami Gange, and the Mission Organic Value Chain Development for the North Eastern Region (MOVCDNER) focus on promoting organic farming clusters, facilitating certification, and strengthening market linkages. At the state level, schemes like the Deendayal Upadhyay Sahkarita Kisan Kalyan Yojana, the Uttarakhand Start-up Policy 2018, and the Mission Uttarakhand Organic Program have further bolstered organic farming through financial assistance, training, and entrepreneurship development.Significantly, the enactment of the Uttarakhand Organic Agriculture Act, 2019, marked a pioneering step, making Uttarakhand the first Indian state to pass a dedicated organic farming legislation, thus institutionalizing the state's long-term commitment to organic agriculture.

Synergy with Branding, Wellness, and Tourism:

Uttarakhand is globally known for its spiritual centres, yoga retreats, and nature-based tourism. This image offers a powerful branding opportunity to market local organic products as "pure" and "eco-friendly," attracting health-conscious and eco-aware tourists and consumers.

Conclusion:

This study explores the opportunities, trends, and prospects of organic farming in Uttarakhand. The findings show that the number of farmers and the area under organic farming are steadily increasing, reflecting the favourable policies of the state and the ecological suitability of the fragile Himalayan environment. The adoption of cluster-based schemes such as PKVY, RKVY-RAFTAAR, and Namami Gange, along with India's first Organic Farming Act (2019), have further strengthened the organic movement in the state. Although Uttarakhand positions itself as the "organic capital" of India, challenges remain, especially in productivity gaps, input availability, certification, and marketing channels. Addressing these issues will be essential to ensure farmer welfare and long-term sustainability. With continued government support, growing consumer demand, and integration of modern technologies, Uttarakhand has the potential to emerge as a major organic hub in the country. Strengthening public-private partnerships, expanding market access, and increasing awareness among farmers will be important steps towards realizing this vision. With its ecological advantages and supportive policies, Uttarakhand is poised to become the true organic capital of India.

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