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ORGANIC FARMING AND RURAL DEVELOPMENT IN UTTARAKHAND: OPPORTUNITIES AND OBSTACLES

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ABSTRACT
Crops can be grown organically while preserving the environment and assisting farmers. This research examines the potential benefits of organic farming for rural development, particularly in Uttarakhand and the Indian Himalayan Region. It describes how organic farming can enhance soil health, safeguard plants and animals, cut down on the use of dangerous chemicals, and give farmers more options to make money. However, farmers deal with issues like reduced crop yields in the early years, high labor requirements, certification expenses, and challenges in marketing their goods. Organic farming may enhance rural livelihoods and save natural resources with the right government backing, farmer training and improved market facilities.

KEYWORDS: Organic farming, sustainable agriculture, rural development, farmers' well-being, Uttarakhand.

INTRODUCTION
India is a developing nation where a sizable portion of the rural population still relies on agriculture and related activities for work and a living. Agriculture is still a key component of employment and income generation in the development of rural communities (Ministry of Agriculture & Farmers Welfare, 2023). However, this field has been forced to struggle with obstacles like poisoning of food, reduced soil fertility, degradation of the environment, and health risks from excessive chemical use (Bhattacharyya et al., 2015). These issues put barriers to sustainable farming (Gamage et al., 2023). As a result, an interest in growing systems is increasing because they promise ecological, productive and human wealth balance. The positive output of the Green Revolution in the form of providing food and improving agricultural production came with more issues: toxicity of farming, degradation of the environment, destruction of resources and dependency on inputs (Kumar & Sharma, 2020). The mass application of high-yielding variety (HYV) seeds, irrigation, and chemical fertilizers contributed to agricultural growth and foodstuff security. Meanwhile, intensive farming approach leads to soil deterioration and water depletion and issues associated with environmental pollution, growth costs, and profitability along with various environmental concerns too (Srinivasarao et al., 2021)
The indiscriminate application of fertilizers and pesticides has aggravated the environmental pollution issue (Gamage et al., 2023; Karunakaran, 2021; Manisha et al., 2025).
In recent years, there has been an ever-growing interest in organic farming, which is believed to be a practical substitute for traditional agriculture practices. The emphasis of organic agriculture lies on the conservation of natural resources, preservation of soil and environmental health, and decrease in dependency on the chemical inputs required for agricultural activities. Organic farming employs methods such as organic manure utilization, crop rotation farming, composting, using biofertilizers, and biopesticides usage (Dr. G.L. Shendge, 2022)

ORGANIC FARMING: CONCEPT AND IMPORTANCE
The word "Organic" which refers to farming dates back to the year 1940 when English author Lord Northbourne used it in his book Look to the Land. He explained farming as a "living and dynamic process" and put importance on crop rotation, cover crops, and the necessity of natural ecological balance (Paull, 2014).
The history of organic farming in India can be traced back to the great work of Sir Albert Howard. In An Agricultural Testament (1940), Howard stresses the importance of soil health and natural practices in ensuring soil fertility and sustainable agricultural productivity.
Organic farming therefore extends beyond simply avoiding chemical fertilizers and pesticides. It represents a holistic approach that integrates ecological balance, biodiversity management, and soil regeneration (Meena et al., 2020).
The principles of organic farming are grounded in health, ecology, fairness, and care, as articulated by the International Federation of Organic Agriculture Movements (IFOAM). The principle of health emphasizes the well-being of soil, plants, animals, humans, and the planet. Ecology focuses on working with ecological systems and natural cycles. Fairness emphasizes equity and justice for farmers and consumers, while care stresses the protection of the environment and future generations.
Research from India shows that organic cultivation can save farmers 14-19% on inputs and increase profit margins by 3-5%, even though farmers are likely to experience a short-term yield loss of 12-18% while transitioning to organic methods (Reddy et al., 2022). Organic farming is usually more labor-intensive; estimates show that farmers use 10-30% more labor per hectare than in conventional systems. Despite these opportunities arising from increased labor demand, organic farming has some significant obstacles, including complicated certification processes, limited access to markets and low

levels of knowledge and technical assistance about how to farm organically (Ghanghas et al, 2021) .Strengthening farmer training, simplifying certification procedures, improving market linkages, and providing appropriate institutional support can contribute to the wider role of organic farming in sustainable rural development (Kumari & Sinha, 2025).

ORGANIC FARMING AND ENVIRONMENTAL SUSTAINABILITY

Organic management can also improve soil physical properties, including aggregate stability, water infiltration, and water-holding capacity (Williams et al., 2017)These characteristics are particularly relevant to climate adaptation because improved water retention may help buffer drought conditions, while improved soil structure can reduce erosion during periods of intense rainfall.

Organic farming inputs has also been associated with improvements in soil biodiversity. Microbial biomass and enzyme activities have been reported to be 59% and 30% higher, respectively, in organic systems. Such improvements can contribute to soil fertility, pollination, natural pest control, and agricultural productivity (Crowder & Reganold, 2015).

Water-use efficiency varies according to regional conditions and management practices. In arid regions, improvements in soil structure and organic matter have been associated with 20–40% greater water-retention capacity, potentially reducing irrigation requirements during dry periods (Gomiero et al., 2011; Kremen & Miles, 2012)

According to the FAO-related definition organic agriculture relies on ecosystem management rather than external agricultural inputs such as synthetic fertilizers and pesticides (Gomiero et al., 2011).

Organic agriculture can contribute to food safety, reduction of soil degradation, protection of wild and agricultural biodiversity, and reduction of hazardous agrochemicals. However, its effectiveness in reducing greenhouse-gas emissions remains subject to debate (Smith et al., 2019).

ORGANIC FARMING AND FARMER HOLISTIC WELL-BEING

Farmer well-being represents an important but often less emphasized dimension of agricultural sustainability. Conventional agricultural systems may expose farmers to pesticides, herbicides, fungicides, and synthetic fertilizers, creating potential occupational health risks (Atreya et al., 2020)

Organic farming, through the reduction or elimination of synthetic agrochemicals, may provide a safer working environment. Studies have associated organic farming with reduced chemical exposure, improved working conditions, and better nutritional outcomes (Meena et al., 2020; Nankongnab et al., 2020).This dimension is particularly relevant in Uttarakhand, where agricultural activities are largely undertaken manually on terraced fields.

Conventional farming involves pesticides such as organophosphates, carbamates, and synthetic pyrethroids (Garud et al., 2024).These chemicals have been associated with neurological disorders, reproductive problems, respiratory diseases, skin irritation and allergies, endocrine disruption, and increased cancer risk (Jurewicz et al., 2012). Farmers may also handle pesticides without adequate protective equipment, particularly in remote rural areas (Gupta & Gupta, 2020) Thus, the relationship between organic farming and farmer well-being can be viewed through several interconnected dimensions: environmental health, occupational health, physical well-being, mental well-being, and household economic security.

ECONOMIC SUSTAINABILITY WITH ORGANIC FARMING

A major potential economic advantage of organic farming is reduced dependence on external agricultural inputs. Organic systems use farmyard manure, compost, green manure, biofertilizers, and botanical pesticides. Many of these resources may be locally available. (Layek et al., 2023; Reddy et al., 2022) reported that organic farmers in India spend 30–60% less on chemical inputs than conventional farmers. In Uttarakhand, where transportation of chemical inputs into hilly areas can increase costs, locally available organic inputs may reduce some financial burdens

Organic farming is relatively labour-intensive because it requires activities such as manual weeding, compost preparation, and crop diversification. While increased labour requirements may raise production costs, they can also generate employment opportunities in rural areas, particularly where villages face youth migration.

PRODUCTIVITY AND TRANSITION PERIOD

The transition from conventional to organic farming can present economic difficulties. Yields may decline during the first two to three years because of soil ecosystem adjustment, limited availability of mature compost, and changes in pest and disease management (Crowder & Reganold, 2015). Such transitional reductions may particularly affect small farmers with limited financial resources. Over time, however, improvements in soil organic matter, nutrient cycling, and biodiversity may contribute to yield recovery. (Panneerselvam et al., 2015) reported that after transition, organic yields can reach 80–90% of conventional yields (Ponisio et al., 2015) and may exceed conventional yields in rainfed or stress-prone areas.

MARKET PREMIUMS

Organic products can command higher prices in domestic and export markets. However, realization of these benefits depends on certification, market access, consumer awareness, grading, branding, and proximity to markets.(Carlson et al., 2023) reported that Organic agriculture promotes food security, consumer choice, farm profitability, and environmental sustainability, supported by government policies, research investment, consumer demand and premium prices for organic products. Organic farming may also reduce expenditure associated with chemical-related health problems. Such potential savings can contribute to household disposable income and overall economic well-being.

LIVELIHOOD DIVERSIFICATION

Organic farming can support complementary activities such as beekeeping, vermicomposting, organic seed production, processing of millets and pulses, herbal products, and medicinal plant cultivation. (Bisht.,2021) highlighted livelihood opportunities associated with non-timber forest products and community-supported agriculture in the Himalayan region.

ORGANIC FARMING IN UTTARAKHAND

The significance of organic farming extends beyond individual farms to rural livelihoods and community development. Increased labour demand can create employment, while diversified organic production can support local entrepreneurship and value addition (Kumari & Sinha, 2025).

In Uttarakhand, organic farming can be linked with activities such as medicinal plant cultivation, processing, beekeeping, vermicomposting, and the processing of millets, pulses, and herbs. Such diversification may create opportunities for additional income and employment within rural communities.

Table:01 State-wise area under organic cultivation in India FY23 States

State	NPOP (ha)	PGS (ha)	Total (ha)
Madhya Pradesh	1,517,377	104,532	1,621,909
Maharashtra	1,284,314	43,892	1,328,206
Gujarat	935,931	19,824	955,755
Rajasthan	580,680	122,189	702,869
Odisha	195,079	53,635	248,715
Uttarakhand	98,394	143,855	242,249
Uttar Pradesh	68,007	157,478	225,485
Karnataka	82,016	38,866	120,882
Chhattisgarh	16,900	101,938	118,838
Telangana	84,474	17,879	102,353

#NPOP data sourced from APEDA and PGS data from National Centre for Organic and Natural Farming (NCONF). The NPOP data doesn't includes wild harvest area.

The state-wise distribution of organic farming area reveals considerable variation in the relative contribution of NPOP and PGS systems. Madhya Pradesh recorded the largest total organic area (1,621,909 ha), followed by Maharashtra (1,328,206 ha) and Gujarat (955,755 ha). Uttarakhand ranked sixth among the ten states, with a total organic area of 242,249 ha. Interestingly, Uttarakhand exhibited a higher area under PGS (143,855 ha) than NPOP (98,394 ha). PGS therefore accounted for approximately 59.4% of the state's total organic area, compared with 40.6% under NPOP. This pattern distinguishes Uttarakhand from several major organic-farming states, where NPOP constitutes the predominant certification system. The relatively great contribution of PGS in Uttarakhand highlights the importance of participatory certification mechanisms in the state's organic farming sector.

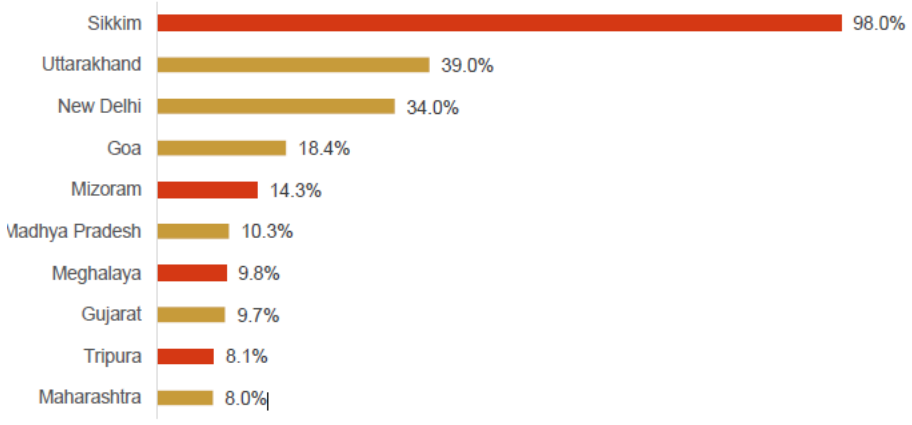


Table 02 Top 10 states having highest share of organic area to NSA (FY23)

Source: APEDA & Land Use Statistics - At a Glance 2023

The state-wise comparison shows considerable variation in the percentage represented by the indicator. Sikkim recorded the highest value at 98.0%, followed by Uttarakhand at 39.0% and New Delhi at 34.0%. Uttarakhand therefore occupied the second position among the states presented in the figure. Its value was substantially higher than that of Goa (18.4%), Mizoram (14.3%), Madhya Pradesh (10.3%), Meghalaya (9.8%), Gujarat (9.7%), Tripura (8.1%) and Maharashtra (8.0%). The findings highlight the relatively prominent position of Uttarakhand on the indicator represented in the figure, although a considerable gap remained between Uttarakhand and Sikkim.

Medicinal and aromatic plants are particularly relevant to this pathway. Uttarakhand is known as the "Herbal State" because of its rich medicinal plant biodiversity. Crops such as lemongrass, tulsi, ashwagandha, chamomile, nettle, and jatamansi provide opportunities for income diversification. According to the National Medicinal Plant Board (2023), medicinal and aromatic plants contribute to rural income and employment in Himalayan regions (Negi et al.,2018). Their compatibility with organic production and potential for value addition further strengthens their relevance to Uttarakhand's rural economy.

Thus, organic farming can potentially contribute to rural development not only through agricultural production but also through diversification, local processing, employment, value addition, and community-based economic activities.

TECHNICAL, FINANCIAL AND MARKET BARRIERS

The barriers Perceived by Farmers in Adoption of Organic Farming identified technical challenges including lack of knowledge about organic pesticides, inadequate training, difficulty in natural pest management, and scarcity of quality bio-inputs. These challenges are particularly important in hill regions where technical services and markets may be limited Bisht,2020 ; Prabhakar & Singh,2025).

Financial barriers include certification costs, yield instability during transition, market-price fluctuations, higher labour requirements, and limited institutional credit. The Uttarakhand Organic Commodity Board (2021) reported that certification can be difficult for farmers because of costs, paperwork, and limited awareness (Sharma,2015).

Market access is another major constraint. (Dadheech and Kaur., 2025) identified poor market infrastructure, limited organized organic markets, and transportation difficulties as factors reducing the profitability of organic farmers in Uttarakhand.

Certification remains particularly important because farmers may sell organic produce in local markets without receiving a price premium when consumers cannot verify its organic status (Reddy et al., 2022) Fragmented supply chains may also result in organic and conventional products being mixed. Limited storage, branding, and transportation further constrain market opportunities (Sharma & Singh, 2020). In the absence of effective cooperatives or producer companies, farmers may depend on intermediaries, reducing their ability to capture greater value from organic production.

Mukherjee et al. (2022) highlighted several challenges in organic farming in India, including labour-intensive weed control, high certification costs, limited market access, inadequate knowledge transfer, and research gaps in soil microbiology, organic pest management, and livestock farming. The authors also emphasized that geographical remoteness and weak marketing systems constrain the profitability of farmers in the Indian Himalayan Region, underscoring the need for improved market linkages, cost-effective technologies, and supportive government policies to promote sustainable organic agriculture.

ROLE OF GOVERNMENT POLICIES

Government programmes such as Paramparagat Krishi Vikas Yojana (PKVY), MOVCD, state organic certification support, and Uttarakhand Organic Commodity Board organic clusters have provided training, subsidies, certification assistance, and marketing support (Mukherjee et al.,2022) However, the literature indicates that the distribution of benefits remains uneven, particularly in remote hill areas. Therefore, the effectiveness of organic farming as a pathway to sustainable rural development depends not only on adoption at the farm level but also on the availability of appropriate technical, financial, certification, and market-support mechanisms.

DISCUSSION

The literature reviewed indicates that organic farming extends beyond an alternative agricultural production technique and represents a multidimensional approach connecting environmental sustainability, farmer well-being, economic resilience, and rural development.

Farmer well-being represents another important dimension. Conventional agriculture can expose farmers to agrochemical risks, while organic farming can reduce dependence on synthetic pesticides and fertilizers ,The reviewed studies associate organic farming with fewer chemical-exposure symptoms, improved working conditions, and aspects of physical and mental well-being . However, these relationships should be interpreted carefully because much of the available evidence identifies associations rather than establishing direct causal effects.

Economic evidence presents a more complex picture. Organic farming may reduce dependence on external inputs, create opportunities for livelihood diversification, and provide access to premium markets. However, these benefits may be offset during the transition period by yield reductions, higher labour requirements, certification costs, and weak market infrastructure (Carlson et al., 2023) Thus, organic farming cannot be assessed solely through environmental benefits or potential price premiums; its economic sustainability depends on the ability of farmers to manage transition costs and access reliable markets.

In Uttarakhand, medicinal and aromatic plants provide an additional pathway for livelihood diversification (Purohit et al.,2026).Their integration with organic production may create opportunities for value addition, employment, and rural economic activity. However, realizing these opportunities requires adequate market linkages, processing, transportation, branding, and farmer organization.

CONCLUSION

The reviewed literature demonstrates that organic farming has implications that extend beyond agricultural production. Its potential contribution to environmental sustainability, farmer well-being, economic resilience, and rural development makes it particularly relevant to the agricultural context of Uttarakhand.

Environmental evidence highlights improvements in soil health, biodiversity, nutrient cycling, and water-related characteristics under organic management .From a farmer well-being perspective, reduced exposure to synthetic agrochemicals may contribute to safer working conditions and improved physical and psychological well-being. Economically, organic farming offers opportunities through lower dependence on external inputs, premium markets, livelihood diversification, and medicinal and aromatic plant cultivation, although transition-period yield reductions, labour requirements, certification costs, and weak market linkages remain important constraints.

For Uttarakhand, the combination of traditional low-input farming practices, ecological characteristics, biodiversity, and medicinal plant resources provides considerable scope for linking organic agriculture with rural livelihoods. However, realizing this potential requires improved technical knowledge, simplified certification, stronger market linkages, and appropriate institutional support.

Overall, organic farming can be understood as a multidimensional pathway connecting environmental sustainability, farmer well-being, economic sustainability, and sustainable rural development. Future research should therefore move beyond yield-focused assessment and examine these dimensions in an integrated manner, particularly within the specific socio-economic and ecological conditions of Uttarakhand.

REFERENCE

1. Atreya, K., Subedi, B. P., Ghimire, P. L., Khanal, S. C., & Pandit, S. (2020). A review on history of organic farming in the current changing context in Nepal. Archives of Agriculture and Environmental Science, 5(3), 406–418. https://doi.org/10.26832/24566632.2020.0503024
2. Bhattacharyya, R., Ghosh, B., Mishra, P., Mandal, B., Rao, C., Sarkar, D., Das, K., Anil, K., Lalitha, M., Hati, K., & Franzluebbers, A. (2015). Soil degradation in India: Challenges and potential solutions. Sustainability, 7(4), 3528–3570. https://doi.org/10.3390/su7043528
3. Bisht, I. S. (2021). Agri-food system dynamics of small-holder hill farming communities of Uttarakhand in north-western India: Socio-economic and policy considerations for sustainable development. Agroecology and Sustainable Food Systems, 45(3), 417–449. https://doi.org/10.1080/21683565.2020.1825585
4. Carlson, A., Greene, C., Raszap Skorbiansky, S., Hitaj, C., Ha, K., Cavigelli, M., Ferrier, P., & McBride, W. (2023). U.S. organic production, markets, consumers, and policy, 2000–21. https://doi.org/10.22004/AG.ECON.333551
5. Crowder, D. W., & Reganold, J. P. (2015). Financial competitiveness of organic agriculture on a global scale. Proceedings of the National Academy of Sciences, 112(24), 7611–7616. https://doi.org/10.1073/pnas.1423674112
6. Dadheech, V., & Kaur, M. (2025). Barriers perceived by the farmers in adoption of organic farming. Journal of Scientific Research and Reports, 31(6), 1265–1277. https://doi.org/10.9734/jsrr/2025/v31i63215
7. Gamage, A., Gangahagedara, R., Gamage, J., Jayasinghe, N., Kodikara, N., Suraweera, P., & Merah, O. (2023). Role of organic farming for achieving sustainability in agriculture. Farming System, 1(1), 100005. https://doi.org/10.1016/j.farsys.2023.100005
8. Garud, A., Pawar, S., Patil, M. S., Kale, S. R., & Patil, S. (2024). A scientific review of pesticides: Classification, toxicity, health effects, sustainability, and environmental impact. Cureus. https://doi.org/10.7759/cureus.67945
9. Ghanghas, B. S., Rohila, A. K., Chahal, P. K., & Mukteshwar, R. (2021). Prospects and constraints experienced in organic farming by farmers. The Indian Journal of Agricultural Sciences, 91(10), 1515–1518. https://doi.org/10.56093/ijas.v91i10.117518
10. Gomiero, T., Pimentel, D., & Paoletti, M. G. (2011). Environmental impact of different agricultural management practices: Conventional vs. organic agriculture. Critical Reviews in Plant Sciences, 30(1–2), 95–124. https://doi.org/10.1080/07352689.2011.554355
11. Gupta, S., & Gupta, K. (2020). Bioaccumulation of pesticides and its impact on biological systems. In P. K. Srivastava, V. P. Singh, A. Singh, D. K. Tripathi, S. Singh, S. M. Prasad, & D. K. Chauhan (Eds.), Pesticides in crop production (1st ed., pp. 55–67). Wiley. https://doi.org/10.1002/9781119432241.ch4
12. Jurewicz, J., Hanke, W., Sobala, W., & Ligocka, D. (2012). Exposure to phenoxyacetic acid herbicides and predictors of exposure among spouses of farmers. Annals of Agricultural and Environmental Medicine, 19(1), 51–56.
13. Karunakaran, N. (2021). Status, benefits and future prospects of organic farming in India: A review. Journal of Management Research and Analysis, 8(3), 103–111. https://doi.org/10.18231/j.jmra.2021.022
14. Kremen, C., & Miles, A. (2012). Ecosystem services in biologically diversified versus conventional farming systems: Benefits, externalities, and trade-offs. Ecology and Society, 17(4), Article 40. https://doi.org/10.5751/ES-05035-170440
15. Kumar, P., & Sharma, P. K. (2020). Soil salinity and food security in India. Frontiers in Sustainable Food Systems, 4, 533781. https://doi.org/10.3389/fsufs.2020.533781
16. Layek, J., Das, A., Ansari, M. A., Mishra, V. K., Rangappa, K., Ravisankar, N., Patra, S., Baiswar, P., Ramesh, T., Hazarika, S., Panwar, A. S., Devi, S., Ansari, M. H., & Paramanik, B. (2023). An integrated organic farming system:

Innovations for farm diversification, sustainability, and livelihood improvement of hill farmers. Frontiers in Sustainable Food Systems, 7, 1151113. https://doi.org/10.3389/fsufs.2023.1151113
17. Manisha, A. P., Saloni, G., Mallika, K., Charu, D. R., & Jasleen, K. (2025). Organic farming: A strategy for a sustainable and secure food system. Plant Science Today. https://doi.org/10.14719/pst.7076
18. Meena, R. K., Meena, R., Naik, B. S. S. S., Meena, B. L., & Meena, S. C. (2020). Organic farming—concept, principles, goals & as a sustainable agriculture: A review. International Journal of Chemical Studies, 8(4), 24–32. https://doi.org/10.22271/chemi.2020.v8.i4a.9812
19. Mukherjee, K., Konar, A., & Ghosh, P. (2022). Organic farming in India: A brief review. International Journal of Research in Agronomy, 5(2), 113–118.
20. Nankongnab, N., Kongtip, P., Tipayamongkholgul, M., Bunngamchairat, A., Sitthisak, S., & Woskie, S. (2020). Difference in accidents, health symptoms, and ergonomic problems between conventional farmers using pesticides and organic farmers. Journal of Agromedicine, 25(2), 158–165. https://doi.org/10.1080/1059924X.2019.1607793
21. Negi, V. S., Kewlani, P., Pathak, R., Bhatt, D., Bhatt, I. D., Rawal, R. S., Sundriyal, R. C., & Nandi, S. K. (2018). Criteria and indicators for promoting cultivation and conservation of medicinal and aromatic plants in Western Himalaya, India. Ecological Indicators, 93, 434–446. https://doi.org/10.1016/j.ecolind.2018.03.032
22. Panneerselvam, P., Hermansen, J. E., Halberg, N., & Arthanari, P. M. (2015). Impact of large-scale organic conversion on food production and food security in two Indian states, Tamil Nadu and Madhya Pradesh. Renewable Agriculture and Food Systems, 30(3), 252–262. https://doi.org/10.1017/S1742170513000501
23. Paull, J. (2014). Lord Northbourne, the man who invented organic farming: A biography. https://doi.org/10.17613/BXFKS-21K54
24. Ponisio, L. C., M'Gonigle, L. K., Mace, K. C., Palomino, J., De Valpine, P., & Kremen, C. (2015). Diversification practices reduce organic to conventional yield gap. Proceedings of the Royal Society B: Biological Sciences, 282(1799), 20141396. https://doi.org/10.1098/rspb.2014.1396
25. Prabhakar, A. C., & Singh, A. (2025). Uttarakhand's organic agricultural products: A sustainable path to green economy and rural prosperity. RESEARCH HUB International Multidisciplinary Research Journal, 12(9), 1–13. https://doi.org/10.53573/rhimrj.2025.v12n9.001
26. Reddy, A. A., Melts, I., Mohan, G., Rani, C. R., Pawar, V., Singh, V., Choubey, M., Vashishtha, T., Suresh, A., & Bhattarai, M. (2022). Economic impact of organic agriculture: Evidence from a Pan-India survey. Sustainability, 14(22), 15057. https://doi.org/10.3390/su142215057
27. Sharma, V. S. M. A. S. (2015). Organic farming: A case study of Uttarakhand Organic Commodity Board. I Control Pollution, 31(2). https://www.icontrolpollution.com/articles/organic-farming-a-case-study-of-uttarakhand-organic-commodity-board-.pdf
28. Shendge, G. L. (2022). Organic farming and sustainable development. International Journal of Scientific Research in Science and Technology, 101–106. https://doi.org/10.32628/IJSRST22953
29. Smith, L. G., Kirk, G. J. D., Jones, P. J., & Williams, A. G. (2019). The greenhouse gas impacts of converting food production in England and Wales to organic methods. Nature Communications, 10(1), 4641. https://doi.org/10.1038/s41467-019-12622-7
30. Srinivasarao, Ch., Rakesh, S., Ranjith Kumar, G., Manasa, R., Somashekar, G., Subha Lakshmi, C., & Kundu, S. (2021). Soil degradation challenges for sustainable agriculture in tropical India. Current Science, 120(3), 492–500. https://doi.org/10.18520/cs/v120/i3/492-500
31. Williams, D. M., Blanco-Canqui, H., Francis, C. A., & Galusha, T. D. (2017). Organic farming and soil physical properties: An assessment after 40 years. Agronomy Journal, 109(2), 600–609. https://doi.org/10.2134/agronj2016.06.0372