

Ragi Farming in the Himalayas: Unlocking the Potential of Finger Millet in Uttarakhand

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Introduction

The Uttarakhand Himalayan region, known for its diverse agro-climatic conditions, has a rich history of cultivating various traditional crops. Among them, finger millet (*Eleusine coracana*), commonly known as "Ragi" or *Mandua* stands out as a crop with tremendous potential for sustainable agriculture. India stands out as the leading producer, contributing nearly 60% of the world's total output (Shukla and Srivastava, 2011). Revered for its resilience, nutritional value and adaptability to the region's mountainous terrain, Ragi has the qualities of a "miracle crop" that can address both the nutritional and livelihood challenges faced by local farmers.

Why Ragi is a Miracle Crop for Uttarakhand?

1. Climate Resilience: The Uttarakhand Himalayan region is characterized by varying weather patterns and challenging growing conditions. Ragi thrives in diverse climatic conditions, ranging from drought to heavy rainfall, making it an ideal crop for farmers in this area. Its deep root system allows it to withstand water scarcity, while its hardy nature enables it to grow in relatively poor soils with minimal inputs.

2. Nutritional Powerhouse: Finger millet is one of the most nutritious cereals, rich in

calcium, iron, dietary fiber and essential amino acids. Its high calcium content, in particular, is unparalleled among cereals, making it beneficial for bone health, especially for children, pregnant women and the elderly. The inclusion of Ragi in the local diet can combat malnutrition, which is a concern in many rural areas of Uttarakhand.

3. Low Input Requirements: Unlike many other crops, Ragi requires minimal use of chemical fertilizers, pesticides and water, making it a cost-effective option for farmers. Its cultivation is well-suited to organic farming practices, which are increasingly gaining attention in the region due to the rising demand for organic products. This aligns perfectly with the sustainable agricultural goals of the Uttarakhand Himalayan region.



4. Adaptability to Terraced Farming: The mountainous landscape of Uttarakhand is dominated by terraced fields, which are often unsuitable for the cultivation of many staple crops. However, Ragi's adaptability to these terraced farms makes it a perfect choice, allowing farmers to utilize their land more effectively. It also prevents soil erosion, contributing to soil conservation in this ecologically sensitive region.

Nutritional value of Finger millet

Finger millet boasts an impressive nutritional profile, with carbohydrate content at 81.5%, protein at 9.8%, crude fiber at 4.3% and minerals at 2.7%. When compared to other cereals like rice, wheat and maize, it shows significantly higher levels of fiber and minerals—wheat has only 1.2% fiber and 1.5% minerals, while rice has 0.2% fiber and 0.6% minerals. The protein in finger millet is relatively well-rounded, containing more lysine, threonine and valine than other millets (Ravindran, 1991; Sripriya *et al.*, 1997).



Image Source: Thapa, 2023

Additionally, black finger millet is noted for its 8.71 mg/g of fatty acids and 8.47 g/g of protein in dry weight (Glew *et al.*, 2008). Varieties of finger millet also provide significant amounts of calcium (ranging from 220-450 mg) and iron (3-20 mg) (Balakrishna *et al.*, 1973). Furthermore, it includes essential amino acids such as isoleucine (4.4 g), leucine (9.5 g), methionine (3.1 g) and phenylalanine

(5.2 g), which are often lacking in other starchy foods. Millets are also rich in B vitamins—particularly niacin, B6 and folic acid—as well as important minerals like calcium, iron, potassium, magnesium and zinc (Vachanth, 2010).

Table 1: Composition of Ragi millets (per 100 g edible portion, 12% moisture content)

Sl. No.	Particulars	Ragi
1	Carbohydrates (g)	72.6
2	Protein (g)	7.7
3	Fat (g)	1.5
4	Crude fibre (g)	3.6
5	Ash (g)	2.7
6	Calcium (mg)	344
7	Phosphorus (mg)	250
8	Iron (mg)	6.3
9	Manganese (mg)	3.5
10	Magnesium (mg)	130

Source: USDA Nutrient database

Cultivation practices for ragi in uttarakhand (thapa, 2023)

1. Soil Preparation: Ragi can grow in a variety of soils, from loamy to sandy, but well-drained, fertile soil yields the best results. Farmers in Uttarakhand can prepare their fields by ploughing and levelling the soil, ensuring proper aeration and weed removal.

2. Sowing: Sowing can be done either through broadcasting or by transplanting seedlings raised in nurseries. The ideal time for sowing Ragi in the Uttarakhand region is from June to July, coinciding with the monsoon season.

3. Water Management: While Ragi is drought-tolerant, moderate irrigation during dry spells can enhance yield. Traditional water harvesting methods, such as using rainwater stored in ponds or small irrigation channels, can be effective for supplementing irrigation.

4. Weed and Pest Management: Timely weeding is crucial during the early stages of growth, as weeds can compete with young Ragi plants for nutrients and moisture. The crop is relatively resistant to pests, but maintaining crop hygiene and using organic pest control measures can further protect it.

Harvesting and post-harvest practices

Ragi matures in about 3-4 months and is ready for harvest when the spikes turn brown. Farmers can cut the entire plant and stack it in small bundles for drying. Threshing can be done manually or with the help of simple machinery to separate the grains from the spikes. Proper drying and storage of Ragi grains ensure that they remain pest-free and retain their quality.

Economic benefits and market potential

The growing demand for healthy, gluten-free, and organic food products has opened up new market opportunities for Ragi farmers. With its high nutritional value, Ragi-based products such as flour, biscuits and snacks are gaining popularity, both in domestic and international markets. This presents a lucrative opportunity for farmers in the Uttarakhand Himalayan region to diversify their income and improve

their livelihoods by cultivating and marketing Ragi.

Challenges and opportunities

Challenges

- I. Lack of awareness among farmers about the benefits of Ragi cultivation.
- II. Limited access to quality seeds and inputs.
- III. Poor marketing infrastructure and limited value-addition facilities.

Opportunities

- I. Training programs and awareness campaigns can educate farmers about Ragi's potential.
- II. Government support for organic farming and value-added products can boost Ragi cultivation.
- III. The development of cooperatives and farmer-producer organizations (FPOs) can help in better marketing and processing of Ragi products.

Conclusion

Finger millet (*Ragi*) has the potential to be a game-changer for sustainable agriculture in the Uttarakhand Himalayan region. Its adaptability to the local environment, coupled with its nutritional benefits and low input requirements, makes it an ideal crop for small and marginal farmers. By promoting Ragi cultivation, Uttarakhand can enhance food security, improve the livelihoods of rural communities and contribute to the region's sustainable development goals. It is time to recognize and harness the potential of this miracle crop to create a more resilient and prosperous agricultural landscape in the Himalayas.

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