

Millets:

Rediscovering ancient grains for sustainable food systems

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Millets, the ancient grains that have long been eclipsed by contemporary cereal crops, are making a comeback as crucial participants in the development of sustainable food systems. This article summarizes millets' nutritional worth, environmental advantages, culinary flexibility and cultural relevance. Millets are high in important nutrients and have a low glycemic index as well as gluten-free features. They are robust crops that grow in a variety of agro-climatic settings, using less water and leaving a smaller water and carbon impact. Their culinary adaptability makes them a perfect element for a range of cuisines, fostering culinary diversity and food security. Furthermore, millets have significant cultural importance, since they relate to ancestral practices and festivities. We can solve global concerns such as food security, climate change, and hunger while maintaining cultural legacy by embracing millets and promoting their production and use. Collaboration among governments, academicians, farmers, and consumers is critical for unlocking the potential of millets and developing sustainable food systems that feed both people and the world.

Keywords: Climate resilience, Food security, Millets, Nutrients

THE modern agricultural landscape faces multifaceted challenges, including climate change, water scarcity, soil degradation, and a growing global population. Traditional monoculture systems, dependent on water-intensive crops like rice and wheat, have proven unsustainable in the face of these challenges. As a result, there is a growing need for alternative, resilient, and sustainable crops. Millets have emerged as a beacon of hope in a world suffering with food shortages, environmental degradation, and the need for sustainable farming practices. These ancient grains are making a surprising return after being eclipsed by contemporary cereal harvests. Millets have a variety of characteristics that position them as crucial participants in the development of sustainable food systems. Millets have a rich

history dating back thousands of years. Originating in Africa and Asia, they have been a staple food in many cultures, contributing to the sustenance of diverse populations. Archaeological findings suggest that millets were cultivated as far back as 7000-5000 BCE, making them one of the world's earliest domesticated crops.

In an era characterized by the growing impacts of climate change, these ancient grains have demonstrated remarkable adaptability and endurance in the face of adverse environmental conditions. Millets are known for their resilience and ability to grow in harsh environments with minimal water and resources, making them ideal for sustainable food systems. They are hardy crops that require less water and can thrive in areas with poor soil fertility. This resilience makes millets an excellent choice

for regions facing water scarcity or those prone to droughts and climate change effects. Millets for instance pearl millet and sorghum have deep root systems which allow them to access moisture from deeper soil layers, making them more drought-resistant compared to other major cereal crops like rice and wheat. This not only conserves precious water resources but also reduces the vulnerability of farming systems to erratic rainfall patterns and prolonged dry spells. Some millet varieties have shorter growing seasons, allowing them to mature quickly. This adaptability is crucial in regions with unpredictable weather patterns and can help farmers mitigate the risks associated with late or erratic rainfall. Furthermore, millets have proven their resilience in hot and arid conditions. They can withstand high temperatures, making them a viable option for

regions experiencing heatwaves and extended periods of extreme heat. They contribute to crop diversity, which is essential for building resilient agricultural systems. A diverse array of crops, including millets, provides a buffer against crop failures caused by climate-related factors, pests, and diseases. An important trait millet crops possess is that these can contribute to carbon sequestration in the soil, helping mitigate the impacts of climate change. Their ability to grow in various soil types and conditions allows for sustainable farming practices that promote soil health and carbon storage. Additionally, compared to rice cultivation, which is associated with significant methane emissions, millet farming generally produces fewer greenhouse gases. This aligns with efforts to reduce the agricultural sector's contribution to climate change.

With rising worries about lifestyle illnesses and a 'refined' eating culture, modern consumers are slowly but steadily turning to nutrient-rich millets (Fig. 1) as a viable alternative to wheat

and rice. With the COVID-19, momentum accelerated, and both urban and rural customers prefer millets to improve their nutrition and immunity. Firstly, in a time of heightened health consciousness and an emphasis on immunity-boosting foods, millets stood out as a nutritionally robust choice. These ancient grains are densely packed with vitamins, minerals, and dietary fibre, making them a prime candidate for enhancing overall health and bolstering the immune system. As the world grappled with the virus, having a fortified immune response became paramount, and many individuals turned to nutrient-rich foods like millets to provide that extra layer of defense against infections. Beyond their nutritional merits, millets also presented practical benefits. Their longer shelf life, compared to many other food staples, made them a desirable pantry item during lockdowns and periods of restricted movement. Consumers could stock up on millets, assured of their longevity and stability, reducing the frequency of grocery

trips in uncertain times. Moreover, the focus on local and sustainable produce during the pandemic gave millets, especially in regions where they are indigenous, an additional advantage. As supply chains faced disruptions and the global food system experienced shocks, locally grown and resilient crops like millets became even more crucial in ensuring food security. In essence, millets' nutritional, practical, and local significance made them particularly valuable during the tumultuous times of COVID-19.

In order to encourage production and consumption of millets, Government of India notified millets as Nutri-Cereals in April, 2018. The Government of India suggested to the United Nations that 2023 be designated as the International Year of Millets (IYoM-2023) in order to generate local and global demand and offer nutritious meals to the people. The Indian proposal was endorsed by 72 countries, and the United Nations General Assembly (UNGA) designated 2023 to be the International Year of Millets on March 5, 2021. As a result, the Hon'ble

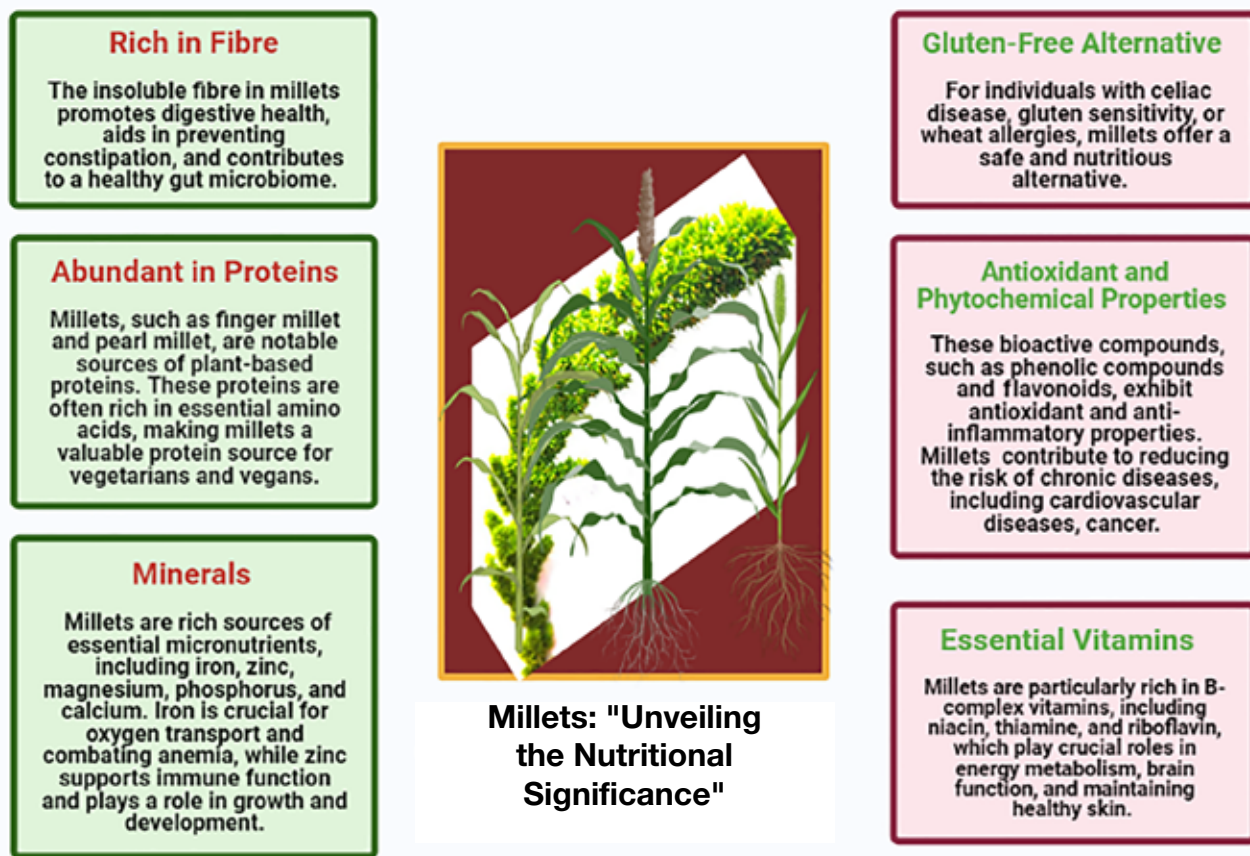


Fig. 1. Nutritional qualities of millets (Author creation).

Union Finance Minister made the following Budget Statement on February 1, 2022: “The International Year of Millets has been declared for 2023. Support will be offered for post-harvest value addition, increasing local demand, and national and worldwide branding of millet goods.” In accordance with the statement made by the Government of India, NABARD wants to increase its involvement with millets through pilot projects, stakeholder discussions, FPOs, capacity building, publication, and other means.

Area and Production

India holds the distinction of being the world’s largest producer of millets. Two prominent varieties of millets in India, namely pearl millet (*Bajra*) and sorghum (*Jowar*), collectively contributed approximately 19% to the global millet production in 2020. Pearl millet accounted for 40.51% of the world’s millet production, while sorghum contributed 8.09%. The leading millet-producing states in India include Rajasthan, Karnataka, Maharashtra, Uttar Pradesh, Haryana, Gujarat, Madhya Pradesh, Tamil Nadu, Andhra Pradesh, and Uttarakhand. These ten states collectively accounted for around 98% of India’s millet production during the period of 2020-21. Among them, Rajasthan, Karnataka, Maharashtra, Uttar Pradesh, Haryana, and Gujarat contributed more than 83% of the total millet production, with Rajasthan alone

Table 1. Nutritional values of millets (for 100g of each millet)

Millet	Protein (g)	Fibre (g)	Minerals (g)	Iron (mg)	Calcium (mg)
Sorghum	10	4	1.6	2.6	54
Pearl millet	10.6	1.3	2.3	16.9	38
Finger millet	7.3	3.6	2.7	3.9	344
Foxtail millet	12.3	8	3.3	2.8	31
Proso millet	12.5	2.2	1.9	0.8	14
Kodo millet	8.3	9	2.6	0.5	27
Little millet	7.7	7.6	1.5	9.3	17
Barnyard millet	11.2	10.1	4.4	15.2	11

accounting for 28.61% (APEDA). India cultivates a diverse range of millet varieties, including pearl millets, sorghum, finger millet, foxtail millet, kodo millet, barnyard millet, proso millet, little millet, and pseudo millets such as buckwheat and amaranths. Among these, pearl millet, sorghum, and finger millet hold the largest shares in India’s total millet production.

The declaration of an International Year of Millets can serve several purposes and address various challenges related to global food security, nutrition, and sustainable agriculture. Here are a few reasons why such a designation may be considered important:

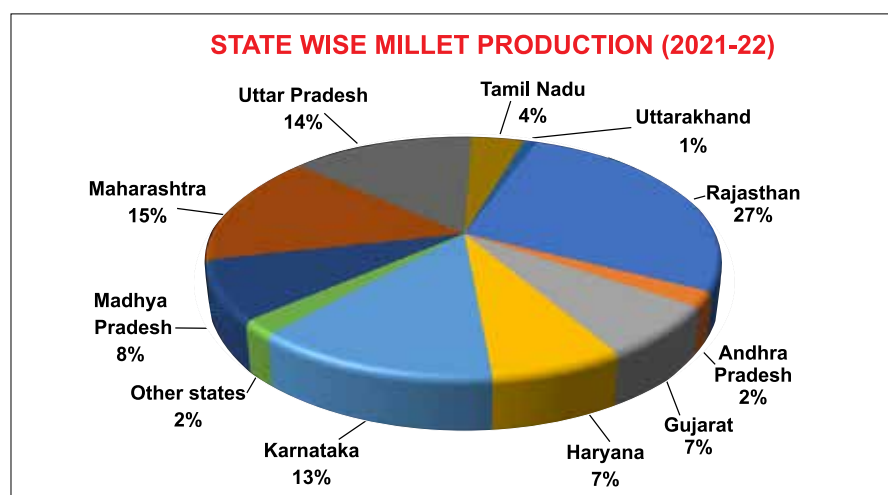
Nutritional benefits: Millets are highly nutritious (Table 1), gluten-free grains that are rich in fibre, protein, vitamins, and minerals. They offer numerous health benefits, including managing diabetes, reducing the risk of heart diseases, and improving digestion. Raising knowledge of millets can stimulate their intake and help to better nutrition, especially in areas where malnutrition and diet-related

disorders are common.

Millets are excellent sources of dietary fibre, which aids in digestion, helps regulate blood sugar levels, and promotes a feeling of fullness, aiding in weight management. They contain a moderate to high amount of protein, making them a valuable source of plant-based protein for vegetarians and vegans. They are particularly rich in essential amino acids like lysine and tryptophan. Millets are predominantly composed of complex carbohydrates with a low glycemic index. This means they provide sustained energy without causing rapid spikes in blood sugar levels. Additionally, some millet varieties contain antioxidants like phenolic compounds and flavonoids, which have anti-inflammatory and disease-fighting properties. These antioxidants may help reduce the risk of chronic diseases. Millets are particularly abundant in minerals such as iron, which is essential for oxygen transport in the body, and magnesium, which plays a crucial role in muscle and nerve function.

Food security: Millets are climate-resilient crops that can grow in harsh and marginal environments with minimal water requirements. They have the potential to improve food security, particularly in areas prone to drought, heat waves, and other climate-related issues. Promoting millet cultivation and consumption can diversify agricultural systems, minimize reliance on a few large staple crops, and provide farmers and consumers with as an other alternatives.

Sustainable agriculture: Millets are considered environmentally friendly crops due to their low water and fertilizer requirements and their ability to thrive in poor soil



Source: APEDA, Ministry of Commerce and Industry

conditions. Millets may contribute to sustainable agriculture practices, preserve water resources, increase soil health, and reduce greenhouse gas emissions by adding them into farming systems. Declaring an International Year of Millets can raise awareness of the importance of sustainable agricultural practices and encourage their widespread adoption.

Biodiversity conservation:

Millets are part of the world's agricultural biodiversity and are available in various types, colours, and sizes. Encouraging the cultivation and consumption of millets can contribute to the preservation of traditional and indigenous seed varieties, conserving agro-biodiversity, and safeguarding cultural heritage associated with these crops.

Economic opportunities: Millets have the potential to generate economic opportunities, particularly for smallholder farmers and rural communities. By promoting the production, processing, and marketing of millets, the International Year of Millets can raise awareness about their economic value, create market demand, and support income generation in rural areas.

Future thrusts

Despite their high nutritional value, millets are consumed at a lesser rate than other basic crops. This tendency is influenced by a variety of things. For instance, customers, particularly in metropolitan areas, are unaware of the health advantages and



Panicle of Foxtail millet (*Setaria italica*)

nutritional worth of millets. Traditional millet consumption knowledge and cultural practices have also declined over time. To remedy this, it is critical to improve public awareness and educate people about millets' nutritional advantages and culinary flexibility. Urbanization and globalization have resulted in a shift in dietary choices towards processed and convenient meals. Millets, being ancient grains, have fallen out of favour with newer generations who are more exposed to modern dietary options. Furthermore, the assumption that millets are linked with lower socioeconomic level has led to their consumption fall. Millet consumption is further hampered by a lack of availability and accessibility. Historically, agricultural policy and market focus have favoured high-yielding crops like rice, wheat, and maize, resulting in restricted supply and selling prospects for millets. This makes it difficult for customers to include millets in their diets. Overall, the designation of an International Year of Millets can



Field view of proso millet (*Panicum miliaceum* L.)

help raise awareness, mobilize support, and catalyze actions at the national and international levels to promote sustainable agriculture, enhance food security, improve nutrition, and preserve agricultural biodiversity.

SUMMARY

The resurgence of millets in modern agriculture signifies a return to ancient wisdom in addressing contemporary challenges. In conclusion, millets stand as ancient grains with a multitude of advantages for fostering sustainable food systems. These remarkable grains are not only packed with nutrition but also leave a minimal ecological footprint, demonstrate resilience in adverse conditions, and exhibit great versatility in culinary applications. Encouraging the resurgence and widespread consumption of millets holds the potential to make substantial contributions to sustainable agriculture, enhance food security, and promote healthier dietary choices for individuals and communities alike. Furthermore, millets exemplify climate resilience in agriculture. Their adaptability to adverse environmental conditions, efficient use of water, and contribution to biodiversity make them a valuable asset in the fight against climate change. As the world seeks sustainable agricultural solutions to cope with an increasingly unpredictable climate, millets stand as a promising crop for resilient and sustainable food systems.

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Field view of Foxtail millet