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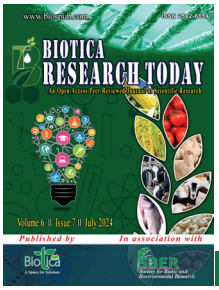

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Millet Manifesto: Cultivating Sustainable Futures in the Face of Climate Change

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Abstract

This article examines the profound impact of climate change on global food and nutritional security, focusing specifically on the challenges and opportunities faced by India, particularly in the context of 2023, designated as the Year of Millets. It emphasizes the indispensable role of millets in addressing these challenges, particularly in providing a climate-resilient solution for food and nutritional security. The discussion revolves around critical concerns like declining agricultural yields, soil degradation, widespread malnutrition and increasing water deficits. The article advocates for a cohesive strategy that blends traditional agricultural insights with modern technological advances. This strategy emphasizes the harmonization of age-old farming practices with cutting-edge innovations, the optimization of agricultural supply chains and a decreased dependence on international agricultural resources. This approach aims to fortify food security in a changing climate, with millets playing a key role due to their resilience and nutritional benefits.

Keywords: Climate change, Food security, Millets, Sustainable agriculture

Introduction

Climate change, a global phenomenon with profound effects on the environment, has become one of the most pressing challenges of our time, particularly in its impact on food and nutritional security. This crisis involves not only the quantity of food produced but also the quality and diversity of food available globally. In countries such as India, where agriculture is crucial to the economy and societal well-being, the impacts of climate change are particularly profound. Agriculture, a vital pillar of the Indian economy, supports approximately 60% of the population and contributes about 18% to the nation's GDP. India's varied agricultural landscape, with its diverse crops and farming practices, is increasingly susceptible to the negative effects of climate change, such as unpredictable rainfall patterns, extreme weather events like droughts and floods and changes in temperature regimes (Gregory *et al*., 2005). These effects not only threaten crop yields but also affect the quality of food, leading to nutritional deficiencies and impacting public health. The challenge is compounded by India's large and growing population, which necessitates a sustainable and resilient food production system (Saxena *et al*., 2018). Traditional staples like rice and wheat are particularly susceptible to climate variations, thereby raising concerns about food security. Food security remains a top development priority for India because the country's relatively high economic growth rates have not translated into reduced hunger and undernutrition. In this context, millets, small-seeded grasses cultivated in the semi-arid tropics of Asia and Africa, present a sustainable alternative. Their natural resilience to extreme weather conditions and minimal reliance on synthetic fertilizers and pesticides make them ideal crops in the face of climate change. Additionally, millets are nutritionally superior to many conventional cereals, being rich in essential amino acids, vitamins and minerals and having a low glycaemic index, which is beneficial for managing diabetes and other lifestyle diseases. Therefore, we propose that small millets have the potential to become new staple crops, especially in regions prone to hunger (Muthamilarasan and Prasad, 2020).

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Given these attributes, reviving millets in agricultural systems can be crucial for ensuring food and nutritional security in the face of climate change. This transition not only paves the way for sustainable agriculture but also supports global efforts to combat malnutrition and health issues related to dietary habits. Promoting millets can result in more diversified diets, reducing the dependence on a few staple crops and thereby mitigating the risks associated with monoculture farming. Priority should be given to the most vulnerable areas, with investments in early warning systems and sustainable agricultural adaptation (Birewar, 2023). Climate change, once relegated to the domain of academic discussions and futuristic projections, has now firmly established its devastating footprint on the global stage. With each passing year, the tangible manifestations of this existential crisis become increasingly evident, laying bare our collective vulnerabilities. The changing climatic patterns don't just represent environmental shifts but pose tangible threats to India's food security, livelihoods and overall socio-economic stability (Raveendran and Naik, 2023). This article seeks to examine the diverse effects of climate change on food systems and highlight the crucial role that millets can play in alleviating these impacts. By examining various strategies, including policy interventions, research initiatives and awareness campaigns, we can better understand how millets can be integrated into the broader framework of food security strategies, ensuring a sustainable and resilient future for food systems globally.

The Multifaceted Challenge of Food Security

Food security, a complex and multi-dimensional issue, encompasses not just the availability but also the quality and nutritional value of food. The International Food Policy Research Institute warns of an impending risk of rising hunger in India, intensified by climate change, with substantial impacts anticipated by 2030. This situation presents several primary challenges:

1. Crop Yield Impact

Climate change manifests in various forms, including high temperatures, changing precipitation patterns and extreme weather events such as droughts and floods. These changes have a direct and profound impact on agricultural productivity. For instance, increased temperatures can hasten crop maturation, reducing yield potential, while irregular rainfall patterns can disrupt the planting and harvesting cycles, further diminishing crop yields.

2. Soil Erosion

The degradation of soil quality due to unsustainable farming practices, such as excessive ploughing and overuse of chemical fertilizers, leads to soil erosion. This not only results in lower agricultural yields but also affects soil fertility and water retention capacity. In India, it is projected that soil erosion could lead to a reduction in crop yields by as much as 10% by 2050, a significant concern for a country heavily reliant on agriculture.

3. Malnutrition and Water Shortages

These are intertwined challenges that exacerbate the food security crisis. Inadequate and contaminated water supplies not only limit crop growth but also pose health risks, contributing to malnutrition. In densely populated regions like India, the competition for water resources intensifies these problems. Malnutrition, in turn, is a multifaceted issue, influenced by not only the quantity of food available but also its nutritional quality. Poor diets lacking in essential nutrients contribute to various health issues, including stunting, wasting and micronutrient deficiencies.

The Path Forward: A Blend of Traditional and Modern Practices

Addressing the challenges in food security necessitates a strategic and multi-faceted approach that synergizes the strengths of both traditional wisdom and modern innovation. This approach should encompass:

1. Balancing Modern and Traditional Techniques

Modern agricultural practices, with their efficiency and scalability, are indispensable. However, they need to be judiciously balanced with traditional agricultural knowledge, which offers invaluable insights into sustainable soil management and crop diversity. This balance is crucial for maintaining soil health and reducing reliance on chemical inputs, ultimately leading to a more sustainable agricultural ecosystem.

2. Leveraging Postmodern Technologies

The application of cutting-edge technologies, such as solar-powered weed removal robots, can revolutionize farming practices. Additionally, sustainable methods like aquaponics, which combines fish farming with plant cultivation, represent innovative ways to maximize resource efficiency. These technologies not only enhance productivity but also support environmental conservation, crucial in the face of climate change.

3. Decreasing Dependency on Foreign Corporations

Reducing reliance on imported seeds and agricultural chemicals is critical for national food sovereignty. This involves supporting domestic agricultural research and development to create locally adapted seeds and organic alternatives to chemical fertilizers and pesticides. Cultivating a level of self-reliance in agricultural inputs not only secures national food supplies but also protects against global market volatilities.

Millets: A Sustainable Solution

In tackling the challenges of food and nutritional security amidst climate change, the role of small millets emerges as a multifaceted solution. Renowned for their ability to thrive in adverse conditions, such as poor-quality soils and minimal irrigation, millets offer numerous advantages:

- *Resilience and Economic Benefits*: Small millets ensure subsistence and income for marginalized populations due to their minimal yield loss in adverse conditions. Despite lower production and yield compared to major cereals, millets offer better gross and net returns and a favourable benefit-cost ratio.
- *Sustainability of Agriculture*: Cultivating small millets

reduces reliance on synthetic fertilizers, pesticides, herbicides and insecticides. They have a lower global warming potential (GWP) and carbon equivalent emissions (CEE) compared to major cereals such as rice and wheat.

• *Decreasing Dependence on Major Cereals*: Incorporating small millets can reduce reliance on staple foods such as rice and wheat, which dominate global consumption patterns.

• *Enhanced Food Quality*: Millets are highly nutritious without compromising taste and texture, important traits for consumer preference.

• *Diversity in Food Sources*: The cultivation of small millets contributes to dietary diversity, counteracting the risks associated with a monoculture diet dominated by a few staple crops.

• *Adaptability*: Various types of millets, including Pearl, Proso and Foxtail, are cultivated globally, demonstrating their adaptability to different environmental conditions.

In addressing the complex challenge of climate change on food security, a comprehensive and adaptive approach is essential. This strategy must tackle immediate issues while also establishing a foundation for long-term sustainability and resilience. Millets, with their remarkable environmental adaptability and nutritional value, stand at the forefront of this strategy, offering a path that synergizes traditional wisdom with modern agricultural innovations.

The integration of millets into agricultural systems signifies more than just an alternative crop choice; it represents a shift towards diversity and resilience in food systems. By broadening the agricultural base with crops like millets, which are less water-intensive and more tolerant to climatic stresses, we can reduce vulnerability to climate-related food shortages. This is especially crucial for developing countries where agriculture remains a primary livelihood source and where the impacts of climate change are most acutely felt. Furthermore, the promotion of millets aligns with global efforts to combat malnutrition. Their rich nutrient profile addresses key deficiencies commonly found in populations reliant on more traditional staples like rice and wheat. The inclusion of millets can thus contribute significantly to enhancing dietary diversity, improving public health outcomes and reducing the burden of diet-related diseases.

Millets taking the Centre Stage at the 2023 G20 Summit in Delhi

In a landmark move showcasing India's commitment to sustainable agriculture and food security, the year 2023, designated as the Millets Year in India, witnessed a significant highlight during the G20 Summit in Delhi. Reflecting this commitment, a special 'Millets Thali' was meticulously curated for the esteemed leaders and foreign delegates, including US President Joe Biden. This initiative was not just a showcase of India's rich culinary heritage but also an embodiment of its dedication to promoting sustainable and nutritious food practices on a global stage.

The 'Millets Thali', crafted without the use of traditional staples like wheat and rice, incorporated five types of millets to create an array of lentil dishes. This was complemented by sweets derived from millets, such as ragi laddoos and barley kheer, blending traditional Indian flavours with innovative culinary techniques. The menu, encompassing nearly 500 items, included several fusion cuisines, reflecting a blend of Indian and international tastes. This was in line with Prime Minister Modi's emphasis on millets, showcasing them as a versatile ingredient adaptable across various cuisines. This culinary initiative at the G20 Summit was a notable gesture towards recognizing and emphasizing the role of millets in tackling global food security challenges. Including millet-based dishes in the menu of prestigious hospitality chains like the Taj further highlighted the growing acceptance of millets as a sustainable food option. By incorporating millets into the summit's cuisine, India not only showcased the health benefits and culinary versatility of these grains but also positioned them as a solution to global challenges related to climate change and agricultural sustainability. This pivotal move at the G20 Summit in Delhi served as a testament to India's leadership in driving a global conversation on sustainable agriculture and food security. It underscored the country's commitment to reinvigorating interest in millets, an ancient yet increasingly relevant crop in our contemporary struggle against climate change and food insecurity.

Conclusion

Addressing the effects of climate change on food security necessitates a strategic combination of traditional knowledge, contemporary farming methods and innovative technologies. Millets, with their lower environmental impact and adaptability, present a viable solution for enhancing food and nutritional security amid climate change. Investing in research and development is vital to unlock the full potential of millets, including breeding programs for improved varieties, sustainable farming practices and efficient processing techniques. Additionally, robust policy frameworks are needed to support and incentivize millet cultivation and consumption. These policies should ensure market access, fair pricing and consumer awareness of millet's health benefits. Collaborative efforts among governments, research institutions, the private sector and farming communities are crucial to advance these initiatives. By recognizing the crop protection and enhancement industry as a critical component of national and global food security strategies, we can mobilize resources and expertise to meet the challenges of climate change. In conclusion, the path towards a sustainable future in food security is multi-dimensional, demanding a balanced approach that respects ecological limits while harnessing the power of innovation. Millets, with their unique combination of resilience and nutritional value, are a vital piece of this puzzle, offering hope and a practical solution in our collective quest for food security in an ever-changing climate.

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