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Popular Article

## Exploring Pearl Millet in the Arena of Climate Change

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### Abstract

In the twenty-first century, achieving global food and nutritional security is difficult due to climate change and economic weaknesses. The dependence on three main food crops wheat, rice, and maize which account for 60% of all the plant-based calories consumed by humans threatens food security even more. Therefore, it is crucial to investigate additional native crops, often known as orphan crops, and discover alternative approaches to the problem of food security. In order to coordinate agricultural research across continents and increase the production of alternative nutritious crops and foods, the Food and Agriculture Organisation of the United Nations has declared 2023 as the International Year of Millets. One of the world's harshest warm-season cereal crops, pearl millet (*Pennisetum glaucum* (L.) R. Br.) is grown mostly in the semi-arid tropics of Asia and Africa for food, feed, fodder, and brewing. It is primarily grown for its high-quality, gluten-free grains with superior nutritious content. Pearl millet is a hardy plant that thrives in tough environments including low fertility, unpredictable rainfall, acidic and saline soils, and sweltering heat. The significance of pearl millet in climate change is highlighted in this article.

### Introduction to Pearl Millet and its Importance

Bajra, commonly referred to as pearl millet, is a grain crop that is widely farmed in Africa and Asia's dry and semi-arid regions. It is a highly prized crop because of all its advantages, especially considering climate change. Farmers in places prone to drought and heat stress may consider growing pearl millet since it is a climate-resilient crop that can thrive in environments with frequent dry spells [6][2]. Pearl millet is also a nourishing crop that is abundant in micronutrients like iron and zinc and can reduce malnutrition and covert hunger [3][6]. Pearl millet is a significant crop for farmers since it has a lot of potential to produce better and more reliable crop yields as a result of climate change. [5][3].



Pearl millet is an important crop in agriculture due to its resilience to climate change and its ability to grow in harsh environments. The extremely varied agro-morphological and adaptative characteristics of pearl millet landraces, such as flowering time and photoperiod, enable the crop to adjust to various environmental conditions. [6]. Furthermore, pearl millet is a hardy crop that requires less water than other cereal crops such as wheat and maize, making it an attractive option for farmers in water-scarce regions [9][3]. As a result, pearl millet has the potential to increase food security and improve the livelihoods of smallholder farmers in developing countries.

In conclusion, pearl millet is a nutritious and climate-resilient crop that has enormous potential for yielding higher and more stable crop yields under climate change. It is an important crop in agriculture due to its ability to grow in harsh environments and its resilience to drought and heat stresses. Pearl millet can also improve nutritional quality and combat malnutrition, making it a valuable crop for farmers in developing countries [6][5][3][1]. As climate change continues to affect agriculture, pearl millet can play a critical role in ensuring food security and improving the livelihoods of smallholder farmers.

### **Effects of Climate Change on Pearl Millet Cultivation**

Climate change has been observed to have a significant impact on pearl millet cultivation. Changes in temperature and rainfall patterns have led to a decrease in the productivity of pearl millet. Heatwaves and droughts, which are becoming more frequent due to climate change, have resulted in a decrease in pearl millet yield [2]. However, pearl millet is a climate-resilient crop that has the potential to increase yields and minimize the adverse effects of climate change [5].

Climate change-induced pests and diseases are also a significant threat to pearl millet cultivation. The downy mildew disease, which is caused by the fungus *Sclerospora graminicola*, is the most devastating disease affecting pearl millet crops [2]. The disease can cause significant yield losses, leading to economic losses for farmers. Furthermore, climate change has led to an increase in the incidence of pests and diseases in pearl millet crops, making it more challenging to cultivate the crop [2].

Despite the challenges posed by climate change, pearl millet remains an essential crop for farmers in arid and semi-arid regions. Pearl millet is a climate-resilient crop with enormous potential for yielding higher productivity under changing climatic conditions [3]. It can grow on poor sandy soils and is well suited for dry climates due to its ability to use moisture efficiently [9].



Additionally, pearl millet has drought and heat tolerance, making it an ideal crop for cultivation in areas prone to drought and heat stress [8]. As such, pearl millet is an essential crop that can help farmers adapt to the changing climate and ensure food security in the face of climate change [3].

### **Qualities of Pearl Millet that make it resilient to climate change**

Pearl millet is a climate-resilient crop that possesses qualities that make it well-suited to thrive in the face of climate change. One of the most notable qualities of pearl millet is its drought tolerance and water use efficiency. As a C4 grass, pearl millet is one of the most drought-tolerant cereals and is typically grown in areas with low annual rainfall [14]. Additionally, pearl millet is adapted to dry and arid conditions, making it a reliable crop in areas where drought is expected to intensify with climate change [5].

Another quality that makes pearl millet resilient to climate change is its heat tolerance and adaptability. Studies have shown that pearl millet has increased yields in dry and warmer sites due to its drought and heat tolerance traits [2]. The crop's high photosynthetic efficiency and excellent productivity in low-nutrient soil conditions make it less reliant on chemical fertilizers [5]. A 2017 study found that drought and heat tolerance in pearl millet increased yields under climate change in both arid and semi-arid tropical climates [8]. Furthermore, researchers have identified genetic variability in pearl millet that enables a better understanding of its heat tolerance and adaptation to changing climates [5].

Pearl millet also possesses pest and disease resistance, making it a hardy crop that can withstand harsh growing conditions. Disease management using resistant cultivars is a feasible way to manage pests and diseases in pearl millet production [19]. The crop's morphological characteristics, forage production, seed formation, and water-use efficiency have been monitored for ten years, and it has been found to be one of the most drought-resistant grains in commercial production [10]. In conclusion, pearl millet's climate-resilient qualities, combined with its high nutritional value, make it an ideal crop for improving nutritional quality and ensuring food security in regions vulnerable to climate change [6][3].

### **Conclusion**

Farmers in arid and semi-arid areas of Africa and Asia highly value the climate-resilient crop pearl millet. It is a sustainable crop that can grow in climates with frequent dry periods and is rich in micronutrients like iron and zinc. Pearl millet hence has the potential to boost food security and enhance the standard of living for smallholder farmers in underdeveloped nations. The



production of pearl millet has been extensively influenced by climate change, with reduced yields as a result of changes in temperature and rainfall patterns. However, because of its drought resistance, water use efficiency, superior yield in low-nutrient soil conditions, and great photosynthetic efficiency make it and heat tolerance, pearl millet continues to be a crucial crop for farmers in arid and semi-arid areas.

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