

Importance of Millets Cultivation in the Context of Climate Change

Anurag Bera¹

¹MSc Scholar, Department of Agronomy, Bidhan Chandra Krishi Viswavidyalaya,
West Bengal

ARTICLE ID: 042

Introduction:

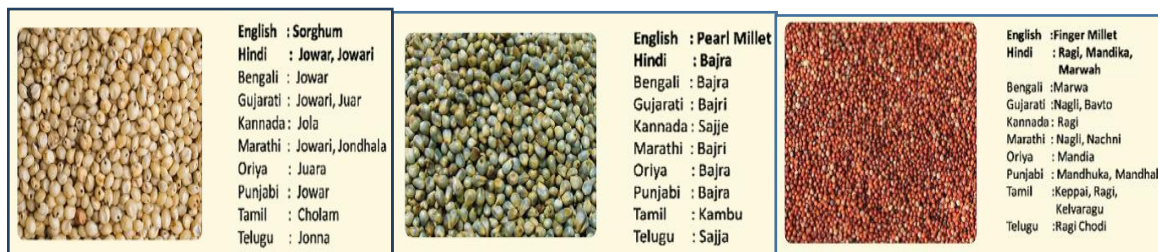
The global climate change and extreme weather fluctuations have emerged as the most threatening challenge to agriculture and allied activities. Impact of climate change due to increase in average temperature, intensity and frequency of drought and flood, aberration of rainfall pattern and elevation in CO₂ concentration is posing serious challenge to entire food production system. The IPCC (2007) have reported that average surface temperature of the earth has been increased progressively by 0.7°C over the last 50 years along with frequency and intensity of extreme events. Beside that, gaseous composition of the atmosphere has undergone a significant change mainly through increased industrial emissions, fossil fuel combustion, widespread deforestation and burning of biomass which ultimately led to global warming. . Several studies have shown that while almost all grain crops are sensitive to these changes, inclusion of more coarse grains or millets in cropping system may help making food supply withstand vagaries of climate change. Millets are generally having both important characteristics i.e. thermophillic (can thrive at relatively higher temperature) and xerophillic (can reproduce in limited water input), which are very much necessary in response to climate change. Millets are rich source of nutrients, antioxidants and proteins. Beside that, they have the ability to sequester carbon thereby reducing the release of atmospheric CO₂ thus contribute in mitigating climate change.

What are the important millets?

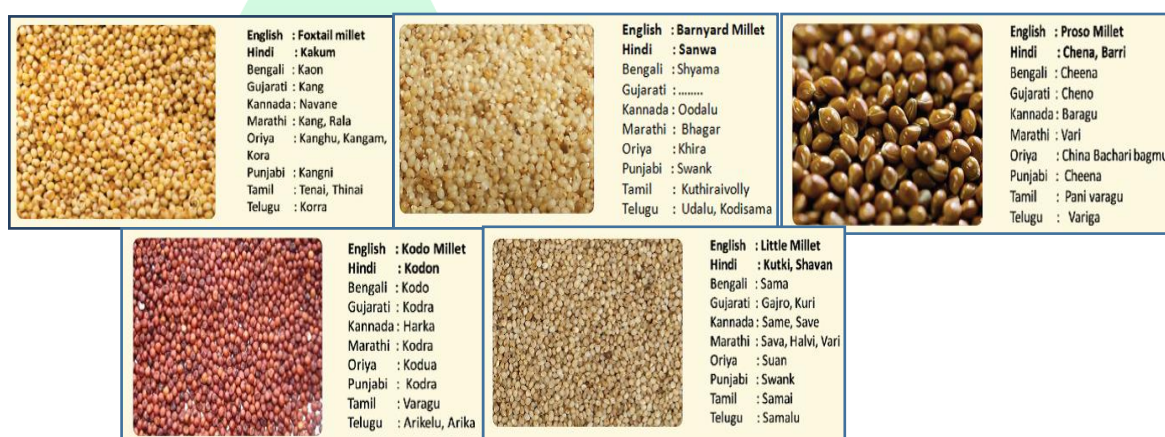
Millets are small-seeded, round whole grain, widely grown around the world as cereal crops or grains for fodder and human consumption purpose. It has an excellent nutritional profile and is a non-glutinous food, which make them easy to digest and non-allergenic. Millets are rich source of nutrients especially phosphorus, potassium, calcium, magnesium and also provide more essential amino acid than other cereals. Although all millet varieties belong to the *Poaceae* family, they differ in colour, appearance, species and specific

characteristics. Based on the popularity and extent of cultivation this crop has been divided into two categories- major and minor millets.

Major millets include-



Minor millets include-



Health benefits of millets:

Consuming polished rice on a daily basis would produce a high percentage of glucose which is not beneficial for diabetic patients, whereas millet as a food commodity releases low volume of glucose, thus making it safer for consumption by diabetic patients. They are low in Glycemic Index (GI) as such don't cause high spike in blood sugar level. Dietary fibre present in millets has water absorbing and bulking property which increases transit time of food in the gut thus help in reducing risk of inflammatory bowel disease and acts as detoxifying agent in the body. Soluble fibre produces viscous substance in our gut that traps the fat and helps in reducing cholesterol level. Millet is rich in phenolic compounds, especially ferulic acid and catechins. These molecules act as antioxidants to protect our body from harmful oxidative stress. Gluten-free grain of millets makes it viable choice for people with celiac disease or those following a gluten-free diet. It can reduce risk of gastrointestinal conditions like gastric ulcers or colon cancer. Millets act as a probiotic feeding microflora in our ecosystem. Therefore, millets should ideally be an integral part of our daily diet.

Why we should opt for Millet cultivation ?

- Cereal crops are not only a major source of macronutrients such as carbohydrates, fats and proteins but also have a significant global warming potential. Among all the major cereal crops, wheat has the highest global warming potential of around 4 tons CO₂ eq/ha followed by rice and maize (around 3.4 tons CO₂ eq/ha). These crops also have a high carbon equivalent emission of 1000, 956 and 935 kg C/ha for wheat, rice and maize, respectively. Despite their higher emission rates, they are widely cultivated and are primary sources of nutrition for the global population. However, the carbon footprints of millets are comparatively lower. Thus millet cultivation can play the role of an alleviator that could reduce carbon footprint in the world.
- Millets are drought resistant crop, requires less water for its growth and development due to an efficient root system. It possesses higher nutritional value compared to other cereal crops such as rice, wheat. It is difficult for the present population to adopt millets as a food in their diet but if proper initiatives are taken by governments through workable policies considering the seriousness of the situation, it can emerge as a crop having enormous potential to feed the growing population.
- Millets can be grown in adverse conditions and thus will be able to save farmers and the agri-food industry from losses. It can be grown in dry soil. Thus, tillage practices can be avoided reducing the duration of cultivation as well as can promote carbon sequestration. Varieties of millets with short growing duration can be incorporated in multiple cropping systems under irrigated and dry farming conditions.

Moreover, millets can be stored for a considerable amount of time under appropriate storage conditions, therefore making them “famine reserves”. Let’s look into the special features of individual millets which make them resilient towards climate change.

1. Sorghum (*Sorghum bicolor L.*), also known as Jowar can tolerate drought condition because of its deep root system, waxy leaves, the presence of mortar cells in stem. It is more suitable than any other cereal crops in dryland condition as it can withstand higher temperature at any stage of its growth.
2. Pearl millet (*Pennisetum glaucum L.*), also known as Bajra can grow on poor sandy soils and is well suited for dry climates due to its ability to use moisture efficiently compared to sorghum or maize. However, unlike sorghum it can’t resist drought or

water stress condition but in such condition it can shorten its life cycle and comes to flowering earlier. This is known as Drought escaping mechanism. Pearl millets are thus generally grown in areas having marginal soil with low annual rainfall in the range of 200–500 mm.

3. Finger millet (*Eleusine corocana L.*), also known as Ragi was earlier considered as minor millets but presently its wider adaptability makes it much more popular among other cereals. It has the best ability to tolerate salinity among cereals.
4. Foxtail millet (*Setaria italica L.*) has a fast ripening mechanism and a high photosynthetic efficiency; hence, it is perfectly suited to be used as a catch crop. It can provide a good yield with only single pre-sowing precipitation. According to Zhang *et al.* this crop is more water efficient compared to maize and sorghum.
5. Proso millet (*Panicum miliaceum L.*) is a relatively short-duration emergency or quick-season irrigated crop with low moisture requirements. It is a relatively low-demanding crop with no known diseases. Proso millet is well suited for many soil types and climate conditions.
6. Barnyard millet (*Echinochloa frumentacea L.*) is a type of millet is considered a minor cereal and is grown widely in India, China, Japan, Pakistan, Africa, and Nepal. It is a drought-tolerant crop can be grown in marginal lands with a rapid maturation rate and possesses high nutritional qualities.
7. Kodo millet (*Paspalum scorbiculatum L.*) is considered as the coarsest cereal of the world. It is said to possess the highest drought resistance among all minor millets and believed to give good yield with a growing period lasting 80–135 days, can thrive well in both shallow and deep soil.
8. Little millet (*Panicum sumatrense L.*) matures quickly and withstands both drought and water logging. The grains are similar to that of rice. Its high fiber content makes it a healthy replacement for rice. Packed with the goodness of B-vitamins, minerals like calcium, iron, zinc and potassium.

Conclusion:

Climate is the primary determinant of agricultural productivity with direct impact on food production across the globe. Agriculture sector is the most sensitive sector to the climate changes because the climate of a region determines the nature and characteristics of

vegetation and crops. Food production systems are extremely sensitive to climate changes like changes in temperature and precipitation, which may lead to outbreaks of pests and diseases thereby reducing harvest ultimately affecting the food security. In such alarming condition, millets can come up as a solution for ensuring food security of ever-burgeoning population. Millets are adaptable almost everywhere in dry regions on clay soils in wet lowlands or in alluvial lands. Their root systems are powerful, able to descend very quickly to a great depth of soil (sometimes up to 2 meters) to extract water and minerals. This characteristic partly explains their quality of hardiness and drought resistance, as well as their high adaptability and resilience to climate change.

The U.N. General assembly recently adopted a resolution, sponsored by India and supported by more than 70 countries, declaring 2023 as the International Year of Millets. The resolution is intended to increase public awareness on the health benefits of millets and their suitability for cultivation under tough conditions marked by climate change.

References:

- Rana D.S., Ghosh P.K., Shivay Y.S., Singh G. (2016). Climate Resilient Agriculture. ,Modern concepts of Agronomy (First ed., pp- 87-112). New Delhi, *Indian Society of Agronomy*.
- Saxena R., Vanga SK., Wang J., Orsat V., Raghavan V. (2018). Millets for Food Security in the Context of Climate Change: A Review. *Sustainability*, **10**, 2228.