

## Nutri Cereals for Food and Nutritional Security

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### INTRODUCTION

Food and nutrition security refers to a situation where all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and preferences for an active and healthy life. Food and nutrition security is when all individuals have reliable access to sufficient quantities of affordable, nutritious food to lead a healthy life. Food and nutrition security has four dimensions that encompass both chronic and transitory (acute) situations: Sufficient food must be produced on a consistent basis and then delivered/imported. Food must be prepared and consumed appropriately based on knowledge of basic nutrition and handling, as well as availability of adequate water and sanitation to prevent food borne disease. The four pillars of food security are availability, access, utilization and stability. Achieving food & nutrition security on a global scale means leaving no one behind, creating equity in food and nutrition. It means everyone having enough of the right, high-quality food, consistently when they need it, along with the financial resources to buy it. MILLETS are being referred as Nutri-cereals are important crops in the country with higher area coverage as compared to wheat and rice before green revolution period. After launching green revolution, the area of nutri-cereals drastically reduced due to shifting of irrigated area from nutri-cereals to more remunerative crops like rice, wheat and sugarcane. At present, Nutri-cereals are grown in resource pooragro-climatic regions, hilly & tribal areas of the country in rainfed conditions. Nutri-cereals are known for nutri-rich content (Gupta et al., 2017) and having characteristics like drought tolerance, photo-insensitivity and resilient to climate change etc. The millets role can never be overlooked for attaining justifiable means for nutritional safety.

## What are the key challenges?

- ❖ **Population** – Although a major part of the Indian population is engaged in agricultural activities, the availability of food for all is a challenge due to the increasing population of the country
- ❖ **Poverty** – This is one of the biggest challenges which need to be overcome in order to attain the desired food security in the country. The percentage of people living below the poverty line (BPL) is extremely high. Know about the Poverty Estimation in India at the linked article
- ❖ **Climatic Change** – Farming and agricultural activities have been severely affected by climatic change over the past few years. Some regions face floods while some experience drought. Similar changes have severely affected livestock, forestry, fisheries and aquaculture
- ❖ **Inadequate food distribution** – The balance between the food distribution has been varied in urban and rural areas
- ❖ **Biofuels** – The growth of the biofuel market has reduced the land used for growing food crops
- ❖ **Corruption** – Diverting the grains to open market to get better margin, selling poor quality grains at ration shops, the irregular opening of the shops adds to the issue of food insecurity
- ❖ **Inadequate storage facilities** – Inadequate and improper storage facilities for grains, which are often stored outside under tarps that provide little protection from humidity and pests
- ❖ **Lack of Awareness** – Lack of education and training on new techniques, technologies and agricultural products. Traditional farming methods are slightly more time consuming and delay the production of food grains, etc.
- ❖ **Unmonitored nutrition programmes** – Emphasis must be given on introducing and enacting well-monitored nutrition programmes

## The opportunity

It is clear that global food systems need to change to achieve food & nutrition security. This creates opportunities for innovative companies of all kinds that can find new ways to meet the key challenges.

From AI to insects and fermentation, the possibilities are exciting and endless. Companies

are already finding smart ways to optimize food production and increase production density to meet rising food demand.

**Nutri cereals:** Millets are group of small grained cereal food crops which are highly tolerant to drought and other extreme weather conditions and are grown with low chemical inputs such as fertilizers and pesticides. Most of millet crops are native of India and are popularly known as Nutri-cereals as they provide most of the nutrients required for normal functioning of human body. Millets are classified into Major Millets and Minor Millets based on their grain size. Pseudo millets are so called because they are not part of the Poaceae botanical family, to which ‘true’ grains belong, however they are nutritionally similar and used in similar ways to ‘true’ grains. Ministry of Agriculture and Farmers Welfare has recognized the importance of Millets and declared Millets comprising of Sorghum (Jowar), Pearl Millet (Bajra), Finger Millet (Ragi/Mandua), Minor Millets i.e., Foxtail Millet (Kanngani/kakun), Proso Millet (Cheena), Kodo Millet (Kodo), Barnyard Millet (Sawa/Sanwa/Jhangora), Little Millet (Kutki), Brown top millet and two pseudo millets i.e., Buck- wheat (Kuttu), Amaranth (Chaulai) as “Nutri-Cereals” for production, consumption and trade point of view.

Millets are gluten free and non- allergenic. Millet consumption decreases triglycerides and C- reactive protein, thereby preventing cardiovascular disease. All millets are rich in dietary fibre. Dietary fibre has water absorbing and bulking property. It increases transit time of food in the gut which helps in reducing risk of inflammatory bowel disease and acts as detoxifying agent in the body.

**Why one should eat millets?** Millets are gluten-free, highly nutritious and rich in dietary fibre. They are rich in micronutrients, including calcium, iron, phosphorus, etc. They are low in Glycemic Index (GI) as such don't cause huge spike in blood sugar. Millets should ideally be an integral part of our daily diet.

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## What are the Health benefits of Millets?

- Millets are anti acidic;
- Millets are gluten free;
- Helps to prevent type 2 diabetes;

- Effective in reducing blood pressure;
- Reduces risk of gastrointestinal conditions like gastric ulcers or colon cancer;
- Eliminate problems like constipation, excess gas, bloating and cramping;
- Millet act as a probiotic feeding micro flora in our inner ecosystem.

From a humble crop that once satiated the poor to the base of a gourmet meal for the health-conscious fitness freaks, millets have made a comeback. While flavors of the grain may vary to suit modern palates, almost every doctor's 'healthy' recipe is still traditional in nature. Lest one forgets, several millets deemed lost or are on the 'fast disappearing' list are cultivated in typically localized regions or documented archaeologically, perhaps for posterity. Millets are traditional staple crops, which perform well in marginal environments and are superior in nutritional properties with high micronutrient and dietary fiber content and low glycemic indices.

**Sorghum:** Sorghum or "Jowar" cereal is perceived to be an important coarse-grained food crop. It is cultivated widely across Maharashtra, Madhya Pradesh, Uttar Pradesh, Haryana, Telangana, Andhra Pradesh, Tamil Nadu and Karnataka and in parts of Rajasthan. Sorghum is a traditional staple food of the dry-land regions of the world, a warm season crop intolerant to low temperatures, resistant to pests and diseases highly nutritious and a climate-compliant crop. It ranks fifth in cereals produced world-wide and fourth in India. Generally, sorghum grains act as a principal source of protein, vitamins, energy and minerals for millions of people especially in the semi-arid regions. On that count, they play a crucial role in the world's food economy. It has a nutritional profile that is better than rice which is the staple food of majority of the human population for its rich protein, fibre thiamine, riboflavin, folic acid, calcium, phosphorous, iron and  $\beta$ -carotene. Sorghum is rich in potassium, phosphorus and calcium with sufficient amounts of iron, zinc and sodium. Due to this, it is being targeted as a means to reduce malnutrition globally. It helps to control heart problems, obesity and arthritis. Adding sorghum regularly in the meals of pregnant women helps them attain the dietary mineral and vitamin requirements. Sorghum helps to control heart problems, body weight and arthritis.

**Pearl millet:** Pearl millet or "bajra" is an extensively grown variety of millet. It is being grown in the African and Indian subcontinent

from ancient times. Known as 'bird feed', in India it is usually grown in Rajasthan, Gujarat and Haryana as it can adapt well to nutrient-poor, sandy soils in low rainfall areas. It is a tall, erect plant and grows from 6-15 ft in height. The plant produces an inflorescence with a dense spike-like panicle, which is brownish in colour. This millet is known to possess phyto-chemicals that lower cholesterol. It also contains folate, iron, magnesium, copper, zinc, and vitamins E and B-complex. Pearl millet has a high energy content compared to other millets. It is also rich in calcium and unsaturated fats, which are good for the body.

**Finger millet:** Finger millet or "ragi" is a short, profusely tillering plant with characteristic finger like terminal inflorescences, bearing small reddish seeds. Maturity of crop is between three to six months depending on the variety and growing conditions. The crop is adapted to fairly reliable rainfall conditions and has an extensive but shallow root system. It is an annual plant extensively grown as a cereal in the dry areas of India, especially in the southern States. Finger millet contains high amount of calcium, protein with well-balanced essential amino acids composition along with Vitamin A, Vitamin B and phosphorous. It also contains high amount of calcium. Ragi flour in Karnataka is mostly prepared into balls, popularly known as "ragi mudde", made into flatbreads, leavened dosa. and thinner, unleavened rotis. Its high fiber content also checks constipation, high blood cholesterol and intestinal cancer. Protein content in finger millet is high, thereby making it an important factor in preventing malnutrition. It is an ideal food for diabetics as it has demonstrated the ability to control blood glucose levels and hyperglycemia.

**Foxtail millet:** Foxtail millet or "Italian millet", is a gluten-free grain and the second most commonly grown species besides being one of the oldest cultivated millet. Generally grown in semi-arid regions, it has a low-water requirement, though it does not recover well from drought conditions because it has a shallow root system. Successful production is due almost entirely to its short growing season. It matures in 65-70 days. Ironically, foxtail millet can be planted when it is too late to plant most other crops. It forms a slender, erect, leafy stem varying in height from 1-5 ft. Seeds are borne in

a spike-like, compressed panicle resembling yellow foxtail, green foxtail, or giant foxtail. The grains are very similar to paddy rice in grain structure. They contain an outer husk, which needs to be removed in order to be used. It has twice the quantity of protein content when compared to rice. Apart from controlling blood sugar and cholesterol, it increases disease resistant capacity and is recommended for people suffering from diabetes and gastric problem. Foxtail millet, with a sweet nutty flavour, provides a host of nutrients and is considered to be one of the most digestible and non-allergic grains available. It contains fibre, protein, calcium and vitamins. It is a nutritive food for children and pregnant women. It is rich in dietary fiber and minerals such as copper and iron that keep one's body strong and immune.

**Kodo millet:** Kodo millet was domesticated in India almost 3,000 years ago. It is an annual tufted grass that grows up to 90 cm high. The grain is enclosed within hard, corneous, persistent husks that are difficult to remove. The grain may vary in colour from light red to dark grey. It has the highest dietary fiber amongst all millets. It constitutes the mainstay of dietary nutritional requirements. It has high protein content (11%), low fat (4.2%) and very high fibre content (14.3%). Kodo millet is very easy to digest; it contains a high amount of lecithin and is excellent for strengthening the nervous system. It is rich in B vitamins, especially niacin, B6 and folic acid, as well as minerals like calcium, iron, potassium, magnesium and zinc. It contains no gluten and is good for people who are glutenintolerant. Regular consumption of kodo millet is very beneficial for postmenopausal women suffering from signs of cardiovascular disease, like high blood pressure and high cholesterol levels.

**Barnyard millet:** Barnyard millet is a good source of protein, which is highly digestible and is an excellent source of dietary fiber with good amount of soluble and insoluble fractions. The carbohydrate content of barnyard millet is low and slowly digestible, which makes the barnyard millet a nature's gift for the present-day people, who are engaged in sedentary activities. In this millet, the major fatty acid is linoleic acid followed by palmitic and oleic acid. It also shows

a high degree of retrogradation of amylase, which facilitates the formation of higher amounts of resistant starches. Hence, it can be potentially recommended for patients with cardiovascular diseases and diabetes. Barnyard millet is most effective in reducing blood glucose and lipid levels. In today's scenario of increased diabetes, this millet could become an ideal food as it does for patients intolerant to gluten, which causes celiac disease.

**Little millet:** Little millet is grown throughout India and is one of the traditional crops of Karnataka. It is mostly mix cropped with other millets, pulses and oilseeds. It is generally consumed as rice and any recipe that demands staple rice can be prepared using little millet. This species of cereal is similar in habit to the proso millet except that grain is smaller. It is an annual herbaceous plant, which grows straight or with folded blades to a height of 30 cm to 1 m. The leaves are linear, sometimes with hairy lamina and membranous hairy ligules. Little millet is reported to have 37% to 38% of dietary fiber (Kumar et al., 2018), termed as a nutraceutical and highest among cereals. Thus, it is a complete food ingredient suitable for large scale utilization as processed products, snacks, baby foods, among several such others, and also plays a major role in propagating food security in the Third World.

**Proso millet:** Proso millet is a short season crop that grows in low rainfall areas. This millet can be cultivated along with red gram, maize and sorghum. The grain contains a comparatively high percentage of indigestible fibre because the seeds are enclosed in the hulls and are difficult to remove by conventional milling processes. It releases energy over a longer period of time after consumption allowing one to work for longer duration without fatigue. This has heavy protein content, crude fiber, minerals and calcium. A health benefit of proso millet comes from its unique properties as is entirely gluten-free and has significant amounts of carbohydrate and fatty acids. It is a cheaper source of manganese as compared to other conventional sources like spices and nuts. It contains high amounts of calcium, which is most essential for bone growth and maintenance. It is proven to reduce cholesterol levels and also reduces the risk of



heart diseases besides preventing breast cancer among other diseases.

**Summary:** Educating farmers on the benefits of millet cultivation, including its high nutritional value and resilience to drought, and training them on best practices for millet farming, including planting, irrigation, and pest control. Incorporating millets in mid-day meals. The central government of India has asked state governments and union territories to add millets, including bajra, ragi, and jowar, to their mid-day meal schemes. Increasing the share of millets in PDS and nutritional programmes. For example, Odisha has planned to introduce millets in PDS, the mid-day meal scheme, and integrated child development services. India has self-sustained in food grain production, but there is still laying the under whelming aspects of nutritional security, a long way to achieve. The primary concern is to convince the farmers in the ground level to grow fortified food grains which provide equal amount of harvest. As per now there is no strong parameter to measure the avail nutrient status of food grain just like Brix content in sugar

industry. We need ore policy, interventions and mutual cooperation to produce and adoption of the nutri-cereals as a staple food in every household. It was realized that millets have substantial potential to contribute toward food and nutritional security in India. As a result, millets should be brought out of NUS and considered as another staple food along with rice and wheat. Accordingly, research and development efforts and policy formulations are required ; some st eps have been taken throughout the world, especially in India. However, these efforts are far from adequate. On the supply side, appropriate implementation of the relevant regulations is necessary to ensure continued research and development for improved varieties, availabilityof quality seeds, adequate support for cultivation, satisfactory technology for processing, and marketing millets. On the demand side, millets should be included in the PDS along with rice and wheat, so that they receive an appropriate MPS. At the same time, focused marketing strategies and product development of new and better millet -based products are needed.