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Millets crop role in food and nutritional security of India

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Abstract
The Millets crop also a form an important component of the rainfed traditional cropping systems and contribute significantly to food, fodder, health, nutritional and livelihood security to millions of households, particularly the small/marginal farmers and the inhabitants of rain fed/remote tribal regions. Millets are sustainable crops due to, 2.5 times lesser water requirement than rice, tolerance to high temperature (up to 46 degree centigrade) and soil salinity. They can well fit in any multiple cropping systems due to their short life cycle and wide range of adaptability coastal to hilly agro-ecosystem). Due to change in governmental policies and dietary habits and drudgery in preparation, overall millet consumption in India has declined over the years. Hence, there is need for development of technology that makes millet value added products along with awareness about millets health benefits.

Keywords: millets, production, health, processing nutritional security, food security

Introduction
In India Millets crop includes a number of small-grained cereal grasses capable of growing in harsh environment or some millets crop also grown in opposite environments. These are based on the grain size, millets are grouped as major millets like sorghum and pearl millet and small millets including finger millet (Ragi), foxtail millet (Kangni), kodo millet (kodo), proso millet (Cheena), barnyard millet (Sawan) and little millet (Kutki). Millets are staple food vast majority of rural poor in arid regions of India and also have a high feed value for livestock, poultry and fish. Millets are poor people crop, as they can produce yield in water scarcity region with no use of agro-chemical. They are also rich in beneficial nutrients and are there for can reduce malnutrition problem. Millets are abiotic (drought, temperature and salinity) and biotic (pest and disease) stress tolerant and hence are grains for the future in an era of climate change. The small millet grains have longer storage life, and can be termed as famine reserve. Despite these super characteristics, millets have been replaced by other crops in field as well as on table for a variety of reasons, including policy initiatives which favored cereals. Further, food uses of millets have been confined to areas of their cultivation.

Fig 1: Image of millet

Production Scenario

India is the largest producer of millet (37 %) followed by Niger (11%). In India, millets are cultivated on 15.5million hectare area with 17.2 million tonnes production and 1111 kg/ha productivity and they contributes 7 % in total food-grain production of India. Maharashtra, Rajasthan and Karnataka are major millets producing states in India. The area under millet has been shrinking over the last five decades and almost 50% area under millets has been diverted largely to fine grain cereals, soybean, maize, cotton, sugarcane and sunflower. A combination of factors like low remuneration as compared to other food crops, lack of price incentives and dietary changes have led to shift from production of millets to other competing crops.

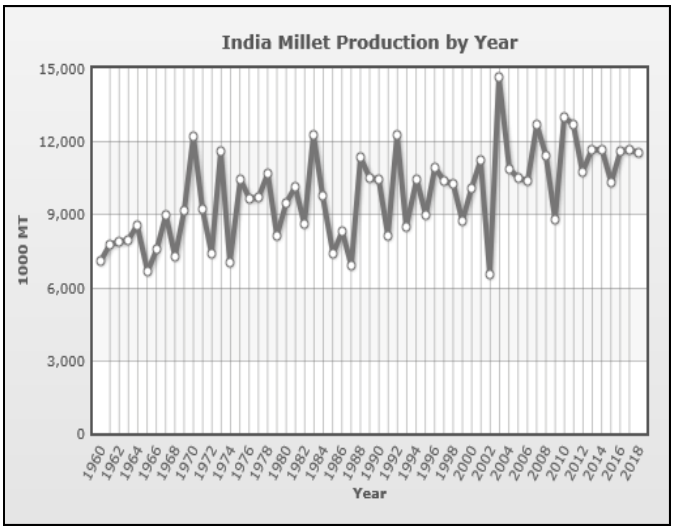

Fig 2: Production scenario of millets in India

Millets and climate change adaptation

Climate change is the biggest threat to agriculture in coming year. It portends less rain, more evaporation, reduced water availability, more heat, poor soil health and increased malnutrition Millets being C4 crops are climate change compliant. These crops are future crop in climate change era as they are drought, salinity and heat tolerance, short to medium duration, less input intensive and resistance to pests and diseases. Further, millets also act as climate change mitigation tool by carbon sequestration and thereby reduce the burden of greenhouse gas.

Millets and health

After almost 71 years of Independence, malnutrition continues to plague India. Vast segments of population in our country are suffering from under-nutrition (micronutrient deficiencies), obesity and chronic diseases like diabetes, cardiovascular diseases, cancer etc. This grim are at least partly due to changing food habits, loss of millets from the diet being one of them. Millets are quite superior to rice and wheat in term of protein, minerals (Fe, Zn, Ca, Mg, P, K), fibre and vit. B (niacin, vit B-6 and folic acid) so, they can be helpful to fight against malnutrition problem. Being low in glycemic index, they are useful for diabetes patents (by releasing glucose slowly over long period). Millets also contain lecithin which strengthen nervous system. Being a rich source of dietary fibre, they provide health benefits like good bowel movement, and reduction in blood cholesterol and sugar level. Besides these, millets are also rich in health-promoting phytochemicals viz. polyphenols, lignans, phytosterols, phytoestrogens, phycocyanins. These function as antioxidants, immune modulators, detoxifying agents etc. and hence protect against age-related degenerative diseases like cardiovascular diseases (CVD), diabetes, cancer etc. Further, millets are non-glutinous (reduce celiac disease), non-acid producing food. Among the millets, pearl millet has the highest content of macronutrients, and micronutrients such as iron, zinc, Mg, P, folic acid and riboflavin. Finger millet is an extraordinary source of calcium. Though low in fat content, it is high in PUFA (polyunsaturated fatty acids) and it is also rich in essential amino acids, like lysine, threonine, valine, sulphur containing amino acids and the ratio of leucine to isoleucine is about 2.

Table 1

NUTRITIONAL CONTENT IN MILLETS

Millet	Iron (in mg)	Calcium (in mg)	Minerals (in g)	Fibre (in g)	Protein (in g)
Pearl millet	16.9	38	2.3	1.3	10.6
Finger millet	3.9	344	2.7	3.6	7.3
Foxtail millet	2.8	31	3.3	8.0	12.3
Proso millet	0.8	14	1.9	2.2	12.5
Kodo millet	0.5	27	2.6	9	8.3
Little millet	9.3	17	1.5	7.6	7.7
Barnyard millet	15.2	11	4.4	10.1	11.2

***Source*:** Millet network of India

Problems associated with millets

- Low productivity and profitability
- Lesser bio-availability
- Less attractive color
- More processing is needed
- Marketing problems
- Lac of quality seed
- Ignorance by researcher and government

Processing of millets

Although, millets have a better mineral profile than but the bioavailability of these minerals is low because of presence of some inherent anti-nutritional factors e.g. phytate, and polyphenols in grain. Several processing techniques malting, blanching, acid treatment have been developed to enhance food value and shelf-life of millet products and to improve the availability of starch, protein and minerals. A wide range of value-added products may be prepared from millet processed flour. In recent years, a variety of traditional and non-traditional, millet-based processed foods and complementary foods have been developed. These can become income-generation activity for women in household industry.

Fig 3: Millets based food product

Governmental policies

With respect to millets production/promotion, some of the existing Government schemes include

1. Initiative for Nutritional Security through Intensive Millets Promotion (INSIMP) – a part of Rashtriya Krishi Vikas Yojana" (RKVY) which is the only comprehensive initiative to support millet production.
2. Rainfed Area Development Programme (RADP) – a component of the Rasht Riya Krishi Vikas Yojana" (RKVY); and.
3. Integrated Cereals Development Programmes in Coarse Cereals based Cropping Systems Areas (ICDP-CC) under Macro Management of Agriculture (MMA).
4. In the 12th plan, our Government has recognized the role of millets in the food chain. Under the National Food Security Mission (NFSM), of the preliminary targets for enhancing food grain production by an additional 25 MT, the share allocated for millets is 2 MT (8% of the enhanced food grain production).

Future prospects

To ensure food and nutrition security, it is important to increase the production of these crops and simultaneously revert the control of production, distribution and consumption back to the people. Governmental support and institute incentives for rainfed farmers is needed to protect bio diverse millet based mixed farming system. Bring fallow and marginal land under millet cultivation. Multi-disciplenry scientific research is need of hour to develop new varieties and production technology to reduce gap between potential productivity and productivity in farmers' fields. Breeding strategies should be redesigned to orient product-specific cultivars. Increase demand of millets by: (i) Creating awareness regarding their nutritional and other health benefits, and environmental sustainability, (ii) Value addition (iii) The government should do partnership with research institutions and food companies to develop new food products. (iv) Inclusion under feeding programme like mid-day meal, Integrated Child Development Services feeding, and adolescent girl's nutrition scheme etc.

Conclusions

Millets (Major and Minor millets) are dual purpose, nutrient dense, hardy and low input intensive crops that have potential to address malnutrition and climate change and can enhance export earnings. Additionally, millets are also rich in health promoting phytochemicals, and can be used as functional foods to protect against age-onset degenerative diseases. Their production potential can be achievable through supply side factors such as high yielding crop cultivars, nutrient management and integrated pest management and also by addressing demand side issues (value addition by processing, nutritional labeling, alternate industrial utilization and policy measures) so as to make millets cultivation more remunerative. With increased demand and profitability, we can inspire farmers to shift to millet cultivation even on better lands which are environmentally and nutritionally beneficial.

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