

A STUDY ON MILLETS BASED CULTIVATION AND CONSUMPTION IN INDIA

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Introduction

“Millets are one of the oldest foods known to humans & possibly the first cereal grain to be used for domestic purposes”.Millets are small-seeded grasses that are hardy and grow well in dry zones as rain-fed crops, under marginal conditions of soil fertility and moisture. Millets are also unique due to their short growing season. They can develop from planted seeds to mature, ready to harvest plants in as little as 65 days. This is important in heavily populated areas. When properly stored, whole millets will keep for two or more years.

Nature's Nutraceuticals

Millets are highly nutritious, non-glutinous and not acid forming foods. Hence they are soothing and easy to digest. They are considered to be the least allergenic and most digestible grains available. Compared to Paddy rice, especially polished Paddy rice, millets release lesser percentage of glucose and over a longer period of time. This lowers the risk of diabetes...[More here](#). Millets are particularly high in minerals like iron, magnesium, phosphorous and potassium. Finger millet (Ragi) is the richest in calcium content, about 10 times that of Paddy rice or wheat. Unlike Paddy rice and wheat that require many inputs in terms of soil fertility and water, millets grow well in dry regions as rain-fed crops. By eating millets, we will be encouraging farmers in dry land areas to grow crops that are best suited for those regions. This is a step towards sustainable cropping practices where by introducing diversity in our diets, we respect the biodiversity in nature rather than forcefully changing cropping patterns to grow wheat and Paddy rice everywhere.

India is the largest producer of Many kinds of millets, which are often referred as coarse cereals. However, realizing the nutrient richness of these grains they are now considered as” nutria-cereals. Small millets, as a group includes several grain crops namely finger millet (rage), kodo millet (varagu), and little (panivaragu). Though they occupy relatively a lower position among feed crops in Indian agriculture, they are quite important from the point of food

security at regional and farm level. India is the largest producer of Many kinds of millets, which are often referred as coarse cereals. However, realizing the nutrient richness of these grains they are now considered as "nutria-cereals". Small millets, as a group includes several grain crops namely finger millet (rage), kodo millet (varagu), and little (panivaragu). Though they occupy relatively a lower position among feed crops in Indian agriculture, they are quite important from the point of food security at regional and farm level.

Small millets can be grown even in poor soil and climatic conditions. They have short growing season and can be very well fitted into multiple cropping systems both under irrigated as well as dry farming conditions. They can provide nutritious grain and fodder in a short span of time. Their long storability under ordinary conditions has made them "famine reserves". This aspect is very important as Indian agriculture suffers from vagaries of the monsoon. Minor millets or small millets as opposed to major millets (Maize, Jowar & Bajra) may be defined as millets cultivated for their small grains which are borne on short, slender grassy plants. In other words they refer to a group of small seeded cereal crops. The most important minor millets cultivated in India are: finger millet (ragi), proso millet, barnyard millet, italian millet, kodo millet, little millet, job's tears and, teff.

Of the total area of 23 million ha under millets ,small millets alone account for about 3.5 million ha; their cultivation extending from sea level in coastal Andhra Pradesh upto an altitude of 8000 feet above sea level in hills of Uttarranchel and North-Eastern states. Small millets have a capacity for wide adaptation. They can withstand a certain degree of soil acidity and alkalinity, stress due to moisture and temperature and variation in soils from heavy to sandy infertile. They are grown from the extreme southern tip of India at sea level to the temperate north Himalayan areas up to an altitude of 3000 metres with consequent variation in photoperiod from short to long days. That is why , it is important enhance production and productivity of these crops to ensure food and nutritional security. An attempt was made in this research paper for examine the actual cultivating areas and the importance of millet crops are analyzed from the data of ministry of agriculture, government of India and some other reliable sources.

Objectives of the study

The following ideas are the specific objectives of this paper.

1. To examine the area, production and productivity of millets in India.
2. To analyze the nutritional quality and advantages of millets for human consumption.
3. To identify the responsible factors limiting productivity of millets .
4. To give some effective suggestions to enhance cultivation area and production.

IMPORTANCE OF MILLETS

The rice eater is weightless like a bird; the one who eats Jowar is strong like a wolf: one who eats Raagi remains 'nirogi' [illness free] throughout his life - An old Kannada saying . India is on the threshold of discussing the Food Security Bill which will have far reaching implications for the poor and the marginalised, in their struggle to access food and nutrition to lead a dignified and healthy life. Millet Network of India has for long, taken the stand that we as a nation, should not just be settling for food security; we should be striving for food sovereignty. This implies that we focus on giving the control over the production, distribution and consumption of food back to the people. One of the steps in doing this would be to bring millets back into the food security debate; for millions of households in the dryland and hilly regions of the country depend on these crops to meet their food needs. We have for long been arguing that the introduction of millets into the public distribution system and into government food programmes like the mid-day meal scheme, is important to achieve the aim of food sovereignty. The recent Global Hunger Index ranks India 64 out of 81 nations. Further, India ranks second in the incidences of malnutrition among children. This is happening despite the universal public distribution system that we have been following for decades. The PDS is laudable in its intention, and no one can dispute the great service that it has been rendering in helping the poor and the marginalized households in meeting their food and nutrition needs. However, the focus that it has laid over these decades, on rice and wheat at the expense of millets has been a telling factor behind these statistics. In the four decades since 1961, the area under millets declined by nearly 50% from about 18 million hectares to about 9 million hectares. During this time, production of millets declined from about 8.8 million tons to about 7.2 million tons; a decline of 18%. These statistics indicate that millions of households are unable to access affordable nutritious food anymore.

An Oath for Millets

For framing a safe earth and a safe climate, safe and nutritious food and, above all, an agricultural future that will keep our planet cooler, poison-free and full of happiness for all of us. We, the people of India, take the following pledge on behalf of our children and future citizens of India. We promise to grow more and more millets on our farms because we firmly believe that they are the future of food and farming for our country. We know that as our earth warms up, it is only millets that can keep the planet cool. We also know that as our climate changes for the worse, the millets on our farms will make it possible to continue agriculture on our earth. We know that if the population in India faces severe malnutrition, it is the millets that will help us to face the crisis. Millets, grown by the poorest farmers of India, braving the worst set of odds, are the best bet to win the future... In the knowledge of all the great advantages offered to us by millets, we pledge as farmers to grow millets on our farm; as consumers to put millets on our plates; and as citizens of this country to bring more and more people into the millet family.

The Concept Called Millets

Mr. PV Satheesh, National Convenor of Millet Network of India outlined the Indian millet landscape while drawing attention to the recent trends, politics and challenges faced by it and highlighting the theme that millets are not just grains but a unique concept. They are not merely individual crops such as Sorghum, Pearl or Foxtail millet but a special culture in food and farming. Millets are grown on marginal lands by some of the poorest and marginalised communities - the dalits, the adivasis and the women in the dry land and hilly regions. They do not demand any external inputs; Seeds, manure - all are farmers' own inputs. And most importantly, the know-how of their cultivation rests within the realm of farmers' knowledge, the most cherished input of all. Thus, millets symbolize the food and knowledge sovereignty of Indian farmers and ensure a life of dignity and self-reliance for them. He pointed out that most millet fields are inherently bio-diverse and that no real farmer grows millets as a mono crop. They grow them in combination with a host of pulses, legumes, vegetables and oil seeds.

A millet farm is a mirror of life in all its diversity and represents an assertion of life in all its robustness. It is this concept that underpins the work of MINI, whose singular focus is on recapturing the traditional biodiversity-based farming systems of which millets are a cornerstone. The members of MINI have been working for a long time to revive these traditional systems of agriculture. Now MINI is engaged in awakening the government to this message while trying to ensure that millets figure prominently in the Food Security Bill. Discussing the recent government Initiative for Nutritional Security through Intensive Millet Promotion (INSIMP) that the move deserves appreciation. However, the net work alerted the farmers to the dangers riddling the scheme, and also necessary to critique the dangerous focus on monocropping of millets. INSIMP has wrongly put a stress on the use of chemical inputs and millet hybrids. This, was completely antithetical to the very concept of millet farming because it compromises the independence of millet farmers by snatching away their control over their farming. 'INSIMP is a false boon for the dry land farmers'.

Threats on Millets Cultivation

The another major threat that millets face in the country in the form of an unnatural promotion of maize, which is resulting in maize invasion in various parts of the country. States like Rajasthan, Orissa, Madhya Pradesh, AP and Karnataka are witnessing large tracts of agricultural lands being occupied by maize, owing to the corporate-induced demand for bio-fuels and poultry feed. Millets are the last true 'agricultural' crops and all steps must be taken by the state to conserve and promote them. Such an action will acknowledge and honour the great service rendered by millet farmers to the food and nutritional security of the nation. The best way for the State to do this is to offer support to farmers in the form of multiple bonuses and also offer other forms of institutional financial support. The most urgent and the strong context for giving such a priority to millets, is provided by the coming decades of 'Climate Change'

which confront us with three challenging scenarios. The first is rising global warming; the second, water scarcity that will acquire frightening proportions; and the third, the projected malnutrition that promises to engulf 70% of the Indian population, particularly the poor and the vulnerable sections. Being hardy and robust crops, millets can withstand and survive harsh climatic conditions. This makes them an ideal solution to the challenge of climate change. It is forecast that with the onset of climate change, wheat which is a thermal-sensitive crop would be hard-pressed to survive. At the same time, rice fields with 2” of standing water and heavy inputs of chemical fertilizers as required under the ‘Green Revolution’ model of cultivation will release methane, a greenhouse gas into the atmosphere, thus rendering rice an utterly unviable crop! Many recent studies have pointed out that 20% of diabetes suffered by the poor in India is caused by the rice distributed and consumed through PDS. So, if we are serious in confronting this problem, we should look at millets for a solution. They must not be seen just as a diabetic food or health food. They do not merely heal our wounds and illnesses, but have the ability to heal our planet. This is what makes them great food crops.

Dr. Rama Naik emphasised the point that millets are among the most nutritious food grains available in India and that the people who consume millets on a regular basis are decidedly more healthy than those who do not. Those who consume millets are found to be fit even in their old age. Those who grew millets consumed very little of it. They sold millets to the urban centers to be consumed as health foods or “fast” foods and millets are not just good for curing diseases, but are good for the management and prevention of various lifestyle diseases like diabetes, obesity and so on. One of the major constraints, that processing facilities were not available at the community level. In order to address this units and found that millets were very expensive compared to rice and wheat. One of the reasons for this, that processing facilities were not available locally in villages. This was a gap that needed to be filled. All the farmers to grow and consume millets, in keeping with the oath that they had taken earlier in the day, because doing so would ensure the mental and physical health of one and all.

Advantages of Millets

All millets are cooked as rice after dehulling. In addition, Italian millet is consumed as stiff porridge called sargatic or as an leavened bread known as roti, after the dehulled grain has been milled into flour. Proso millet flour is also used as a substitute for rice flour in various snack foods. Millet protein lacks gluten, hence it is unsuitable as the sole material for preparation of bakery products. Mudde from millet flour is prepared by steaming the dough and making it into balls. Millet flours are soaked overnight in cold water containing a little butter milk and the slurry after fermentation is used to prepare porridge. Millets and black gram mixed in the ratio of 3:1 are wet ground and fermented overnight which can be steamed to make idli or baked on hot pan to prepare dosa or wet pan cakes. Non conventional foods like flakes, extruded products or by par boiling of millets, popping and malting, products can be prepared from millets. Flakes are prepared by soaking pearled millets in water and then steamed under pressure for complete gelatination of the starch and dried to about 18% moisture. Then they are pressed to requisite thickness between heavy duty rollers and dried to prepare flakes

which hydrate quickly when added to warm water or milk. Noodle like products can be prepared from millet flours. They form nutritionally balanced food which is used as supplementary or weaning foods.

Table No:1.

Trend of Actual Harvested Area, Production and Consumption of Millets in India

Years	Harvested Areas (in 0000'M.Ha)	Growth %	Production (in 0000'M.MT)	Growth %	Consumption(in 0000'M.MT)	Growth %
2001	12000	-7.87 %	900	0.00 %	900	0.00 %
2002	9000	-25.00 %	700	-22.22 %	700	-22.22 %
2003	13100	45.56 %	900	28.57 %	900	28.57 %
2004	11000	-16.03 %	800	-11.11 %	800	-11.11 %
2005	10500	-4.55 %	900	12.50 %	900	12.50 %
2006	10300	-1.90 %	900	0.00 %	900	0.00 %
2007	10800	4.85 %	1000	11.11 %	1000	11.11 %
2008	10000	-7.41 %	1000	0.00 %	1000	0.00 %
2009	10400	4.00 %	700	-30.00 %	700	-30.00 %
2010	11150	7.21 %	1200	71.43 %	1200	71.43 %
2011	10800	-3.14 %	1500	25.00 %	1500	25.00 %
2012	8500	-21.30 %	1200	-20.00 %	1200	-20.00 %

Source: Ministry of Agriculture, Govt.of India and United States Department of Agriculture.

From the table no.1 emphasized that the harvested area and the consumption of millets in India is gradually decreased in an alternative years of 2005-2008 and from the year of 2009 onwards the area harvested gradually increased and then 2011 it is come down to falling. On the other hand the availability quantity for consumption of millets was decreased in 2009 and from the year after 2009 its level goes on increasing and in the year of 2012 onwards comes to a falling rate of -20.00 percent.

Nutritional Value of Millets

The pearled grains soaked in water for 1-2 days, wet ground and the mash cooked, extruded and dried. It makes an excellent crispy product when deep fried. These products can be economically produced as a cottage industry, as it needs simple equipment and it requires low capital investment. Para boiling improves the quality and is also used to prepare expanded grains. Research work in this direction is extremely fruitful. Popping process is explained in the post harvest technology. The volume of popped millets ranges from 8-10 ml/gm and the expanded volumes of each millet during cropping is as follows: Proso millet -12 ml/gm; Kodo millet -11 ml/gm; Foxtail millet- 7 ml/gm; Little millet -7 ml/gm; Barnyard millet-7 ml/gm. Small millets are rarely used to produce starch for industrial uses. Their starches generally exhibit higher

gelatinisation temperature, higher water binding capacity and slow in enzymatic hydrolysis than wheat and rice. Millets may also find use for formulating high fibre and diabetic foods.

Table No: 2

The Principal Field Crops of India :

Crop	Crop group	State with the highest area under cultivation (till 08-9)	Area (in thousand hectares)	State with highest production	Yield (in thousand tonnes)	Second highest yield
Rice	Cereals	Uttar Pradesh	6034	West Bengal	15037	13097 (UP)
Jowar	Cereals	Maharashtra	4071	Maharashtra	3587	1629 (KN)
Bajra	Cereals	Rajasthan	5175	Rajasthan	4283	1302 (UP)
Maize	Cereals	Karnataka	5175	Andhra Pradesh	4152	3029 (KN)
Ragi	Cereals	Karnataka	841	Karnataka	1394	193 (UK)
Small millets	Cereals	Madhya Pradesh	307	Uttarakhand	89	89 (MP)
Wheat	Cereals	Uttar Pradesh	9513	Uttar Pradesh	28554	15733 (PJ)
Barley	Cereals	Rajasthan	287	Rajasthan	878	276 (UP)
Gram	Pulses	Madhya Pradesh	2841	Madhya Pradesh	2786	981 (RJ)
Tur	Pulses	Maharashtra	1009	Maharashtra	605	315 (KN)
Other Pulses	Pulses	Rajasthan	2394	Uttar Pradesh	1148	830 (RJ)
Groundnut	Oilseed	Gujarat	1907	Gujarat	2661	1554 (AP)
Sesamum	Oilseed	Rajasthan	521	Rajasthan	153	133 (WB)
Rapeseed and mustard	Oilseed	Rajasthan	2388	Rajasthan	3806	874 (UP)
Linseed	Oilseed	Madhya Pradesh	126	Madhya Pradesh	48	27 (UK)
Castor	Oilseed	Gujarat	434	Gujarat	852	159 (RJ)
Cotton	Others	Maharashtra	3107	Gujarat	8787	4618 (GJ)
Jute	Others	West Bengal	596	West Bengal	8412	1253 (BH)
Mesta	Others	Andhra Pradesh	62	Andhra Pradesh	544	137 (BH)
Sugarcane	Others	Maharashtra	761	Uttar Pradesh	109048	60648 (MH)

Source: Indian Agriculture Statistical Report, 2011 .

From the table no.2 is clear that cereals crops such as rice and the millets cultivation area and the states of highest production were occupied by Uttar Pradesh and West Bengal the first place while on the other hand it was observed that major millets like jowar, bajra and ragi are taking the first place by the states of Maharashtra, Rajasthan and Karnataka. At the same time the position of minor millets or the small millets Madhya Pradesh took the first place in the area cultivation and Uttarakhand state ranked in the highest production of small millets. The remaining field crops such as wheat, barley, and the various grams are ranked by the states name that are illustrated in the table format. The most important emphasized point from the table that Maharashtra, Rajasthan and Karnataka are the top most states of millets cultivation in India.

The responsible Factors Limiting Productivity of millets

Production of millets and small millets are subject to wide fluctuations and the area is declining. Excepting sorghum, pearl millet, and finger millet, no other millet have showed any improvement in their cultivable area. The major constraints are as follows:

1. Millets are grown on poor shallow and marginal soils under rainfed conditions. Some of these are still grown in the hilly areas under shifting cultivation which is one of the most primitive ways of crop production. The soils on which these crops are cultivated have low moisture retention capacity.
2. Seeds are often broadcast. This is a major bottle neck in taking inter-cultivation operation and effective weed control. The mixed cropping practices adopted by the farmers are mostly suited to sustenance agriculture and many of them are not remunerative.
3. They are often cultivated under unmanured and unfertilized conditions. Non adoption of improved varieties and timely agricultural operations like tillage, sowing, weeding and inter-culturing has resulted in reduced returns. Improved crop management practices are not adopted by the farmers due to socio-economic constraints.
4. Research on crop improvement and agro-techniques was neglected till recently. There is no organized programme for production and supply of seeds of improved varieties. There is no ready market for the disposal of surplus produce at a remunerative price. There is lack of extension and development support. Though a lot of research is done by All India co-ordinate Research Project on Millet Improvement (AICMIP) and State Agricultural Universities, still there is a need to intensify to increase the area and production of millets.

Suggestions to improving the millets cultivation

As millets and small millets are predominantly grown in marginal and sub marginal dry lands by poor farmers, the fluctuations in production not only bring hardship to farmers but also create instability in the total coarse cereal production. So, developmental effort should be made through mini kit demonstrations and State Level Training Programmes. These would help in popularizing the newly released varieties among the farmers in replacing the low yielding local varieties. For this purpose, systematic follow-up action is required for the production of seeds at various stages, its processing and distribution. The improved seed either should be supplied free or subsidized by the Government. The role of non-monetary inputs such as line sowing, optimum row spacing, depth of seeding, optimum plant population per unit area, timely cultural practices for higher productivity should be explained and demonstrated to the farmers right in the field. Agronomic research should bring out efficient low-cost technology which is within the means of

farmers and easy to adopt. Increased use of small millets in various ready-to-eat food products should be encouraged as it enhances their value and market price. Provide millets highest priority in the National Food Security Bill: Government of India should allocate at least 40% of its food security budget to millet based farming and food systems that will use millets as their major food component. Put millets into public food systems of India: Millets need to be integrated into the existing Public Distribution System (PDS) . Also introduce millet meals twice a week in the ICDS, school mid day meals, welfare hostels and such other schemes of the government.

Recognise millets as Climate Change Compliant Crops and promote their cultivation and consumption: Climate change will result in higher heat, drought, lower rainfall and water crisis as well as high malnutrition. For the ecological role they have played dryland farmers need to be recognised and granted monetary bonuses for biodiversity, water conservation and sustaining solutions against climate change. Investment on millet lands which apart from creating permanent investment for the poor can also create at half the cost of NREGA, double the employment days. Convert cultivable fallows into millet farms If the government works determinedly and helps the farmers to cultivate these lands and farm millets, the country will be able to produce a minimum of 25 million tonnes of millets, 5 million tonnes of pulses and fodder that can feed an astounding 50 million heads of cattle. This is a huge opportunity. Start a massive educational and promotional programme on millets and the government must use its media campaign funds to take up millet promotion.

Conclusion

The impact of new methods of field demonstrations indicated vast potential for increase in yield due to new recommended technology. The yield level and income of farmers could be substantially increased by the adoption of recommended technology. Enhancement in yield was around 82 % in finger millet, 95% in little millet, 83% in kodo millet, 43% in foxtail millet, 76% in proso millet & 82 % in barnyard millet. Small millets despite low genetic potential, are grown because of socio-economic conditions of the farmers and assured income under low input conditions. Inclusion of legumes as component crops helped in additional legume yield leading to nutritional security of the family and improved soil productivity and health. Similarly the adoption of other key components like use of new high yielding variety, application of fertilizers etc. showed significant influence on the yield of the crop. All centres have met the indented requirements of the Department of Agriculture and Cooperation, Government of India, to produce breeder seed particularly in finger millet, kodo millet and little millet. Millets are easy to digest, contain a high amount of lecithin and are excellent for strengthening the nervous system. They have niacin, B6 and folic acid, and calcium, iron, potassium, magnesium and zinc. Millets are good for people who are gluten-intolerant. Its fibre content also helps prevent constipation and may reduce the risk of developing bowel disorders including bowel colon. Most executives work long hours with almost no exercise. Restaurants serve rich food with butter, oil and cheese which has led to various health ailments. "However, awareness about the inclusion of millets in our daily meals for healthy living to combat the effects of a more westernized, sedentary lifestyle is needed.

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