

*MILLET in your Meals*



*Issued in public interest by -*



An ISO 22000 Company

### Let's welcome Millets back into our meals

**Millets** - Millet is the name given to a group of cereals other than wheat, rice, maize & barley. They are mostly tiny in size, round in shape & ready for usage as it is. It is acknowledged that during the Stone Age, the **Millet** plant was grown by the lake inhabitants of Switzerland. History reveals that since the Neolithic Era, millet, a prehistoric seed was cultivated in the dry climates of Africa and northern China. Interestingly it was **millets** and not rice that was a staple food in Indian, Chinese Neolithic and Korean civilizations. Eventually, **millets** spread all over the world.

It was heavy, it was tall,  
It sprouted, it eared,  
It nodded, it hung,  
Indeed the lucky grains were sent down to us  
The black millet, the double kernelled, millet, pink sprouted and white.

So goes the folk song from China- a melodious litany to the treasure trove of nutrition, the oldest food know to mankind!



There are about 6,000 varieties of millet throughout the world with grains varying in colour from pale yellow, to gray, white, and red. Archaeologists say that foxtail millet is so old that no wild plant of the species is known to exist today.

**The Millet Story** - The origin of millet is diverse with varieties coming from both Africa and Asia. Pearl millet for example comes from tropical West Africa and finger millet from Uganda or neighboring areas.

From African highlands, finger millet was taken to India about 3,000 years ago and to Europe at the beginning of the Christian era. Later, the crop was widely distributed both in many African countries as well as in the Indian subcontinent.

They have been a part of the human food system from time immemorial. Many types of millet have been found in Harrapan & Mohenjadaro archaeological sites. Africa, the cradle of human civilization, the Mayans, Incas & Aztecs were known to use millets in their myriad culinary courses. The leader of the Shang Dynasty in the 2<sup>nd</sup> millennium BC was known as Hou Chi 'The ruler of Millet'. Our own vedic scriptures like Sathapatha Brahmana have ample references to millets. Kalidasa, in his legendary literary masterpiece 'Shakuntala', has sage Kanva pouring foxtail millet while bidding farewell to Shakuntala in Dushanta's court.

The oldest historical roots of millet are to be found in China, where it was considered a sacred crop. One of the earliest recorded writings dates from 2800 BC giving directions for the growing and storing of the grain. During prehistoric times, people of Northern India were also cultivating millet. Millet's travel continued throughout the Middle East and Northern Africa where it became a staple. It further became typical food of the Sumerian diet about 2500 BC. Millet was even mentioned in the Hebrew bible. The idyllic Hanging Gardens of Babylon were said to have included millet among their treasured plants. Through trading with Eritrea and Somalia circa 3000 BC, the early Egyptians learned from the Africans how to cultivate millet, which would grow well in the dry Sahara, where wheat and barley were unable to thrive.

**Millets** made its way from China to the Black Sea region of Europe by 5000 BC. Romans and Gauls made porridge from it, and in the Middle Ages **millet** was more extensively eaten than wheat. The interesting fact is that the **millet** is also pointed out in the Bible, and was used during those days to prepare bread.

#### Features of the Millet plant -

- Millets are tall, vertical annual grasses similar to Maize.
- **They** vary in appearance and size, depending on variety and grow in height from 1 to 15 feet.
- These plants usually have coarse stems and grow in opaque bunches with grass-like leaves. They are abundant and slim, measuring about an inch broad and can grow over 6 feet long.
- The seeds are covered in colored hulls, with color depending on diversity.
- Since millet is covered with an unusually hard to digest hull, it is necessary to hull it before it can be used. Hulling does not affect the nutrient value as the germ stays intact through this process.
- After hulling, **millet** grains appear as small yellow spheres.

#### Vernacular Names of Millets

ENGLISH	OTHERS	BOTANICAL	HINDI	KANNADA	TAMIL	TELEGU	MALAYALAM
Sorghum	Great Millet / Milo / Chari	Sorghum Vulgare	Jowar	Jola	Cholam	Jonnalu	Cholum
Pearl Millet	Spiked Millet / Bullrush	Pennisetum Typhoideum	Bajra	Sajje	Kambu	Gantilu / Sazzalu	Kambu

Finger Millet	Rajika	Eleusine Coracana	Mandua /Madua	Ragi	Kelvargu / Kezhvaragu	Ragulu	Moothari
Barnyard Millet	Japanese Millet / Sawank	Echinochloa Frumantacea	Jhangora / Shama	Samai	Kuthiravaali	Odalul / Bonta Chamula	-
Foxtail Millet	Moha Millet / Italian Millet	Setarai Italica	Kangni	Navane / Priyangu Thene	Tenai	Korra / Korralu	Thina
Kodo Millet	Pakodi / Manakodra	Paspalum Scrobiculatum	Kodra	Harka	Varagu	Arikelu	Varagu
Proso Millet	French Millet / Common Millet	Panicum Miliaceum	Barri	Baragu	Panivaragu	Varigulu / Varagalu	Panivaragu
Little Millet	Goudli / Gondola	Panicum Miliare	Kutki	Same	Samai	Sama	Chama
Amaranth	Arikisira	Amaranthus Species / Chakravarthikeerai	-	-	Keerai Vidai	Thotakoora Ginjalu	Cheera Vitu

ENGLISH	MARATHI	GUJRATHI	BENGALI	ORIYA	KASHMIRI
Sorghum	Jwari	Jowar	Jowar	Janha	-
Pearl Millet	Bajri	Bajri	Bajra	Bajra	Bajru
Finger Millet	Nachni	Bhav / Nagali / Bavto	Mandua /Madua	Mandia	-
Barnyard Millet	Shamul	Sama	Shamula	-	-
Foxtail Millet	Rala	Ral Kang	Syama Dhan	-	Shol
Kodo Millet	Harik	Kodra	Kodoadhan	Kodus	
Proso Millet	Vari	Vari	-	Chinna	Pingu
Little Millet	Sava	Gadro	Kangani	Suan	Ganuhaar
Amaranth	-	-	-	-	-

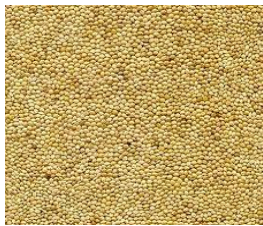
## Types of Millets



**Jowar, Jola or Sorghum** is a cereal perceived to be an important coarse grained food crop. It is cultivated widely across Maharashtra, Madhya Pradesh, Uttar Pradesh, Haryana, Andhra Pradesh, Tamil Nadu and Karnataka and in parts of Rajasthan. Sorghum is rich in potassium and phosphorus and also has a good amount of calcium with small amounts of iron and sodium. Sorghum grain has high levels of iron and zinc and is hence being targeted as a means to reduce micronutrient malnutrition globally. Adding sorghum regularly in the meals of pregnant woman helps them attain requirements for minerals and vitamins in their diet. Jowar helps control heart problems, body weight and arthritis.



**Bajra, Sajje or Pearl Millet** is an extensively grown variety of millet. It is grown in the African and Indian subcontinent from ancient times. It is known the world over as bird food and is usually grown in Rajasthan, Gujarat and Haryana because 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 phytochemicals that lowers cholesterol. It also contains folate, magnesium, copper, zinc, and vitamins E and B- complex. "Bajra" has a high energy content compared to other flours. It is also rich in calcium and unsaturated fats which are good for the body.



**Baragu or Proso Millet** – is one of the most nutritious and delicious temperate millet, also known as broom corn, common millet. Proso millet is well suited for many soil types and climate conditions. Compared to all millets proso is a short season crop, reaching maturity 60 to 75 days after planting. It is most frequently grown as a late seeded summer crop. Proso millet grows three to four feet. Its compact panicle droops at the top like an old broom, hence the name broom corn. Its round seeds are about 1/8 inch wide and covered by a smooth, glossy hull. 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.



**Ragi or Finger millet** is a short, profusely tillering plant with characteristic finger like terminal inflorescences, bearing small reddish seeds. Maturity of crop is between 3 to 6 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 southern part of India. Ragi 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 ragi 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.



**Navane or Foxtail millet** is a gluten free grain is and the second most commonly grown species. It is 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. 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.



**Araka or Kodo millet** was domesticated in India almost 3000 years ago. It is found across the old world in humid habitats of tropics and subtropics. It is a minor grain crop in India, and an important crop in the Deccan plateau. Its cultivation in India is generally confined to Gujarat, Karnataka and parts of Tamil Nadu. Kodo is an annual tufted grass that grows up to 90 cm high. The grain is enclosed in hard, corneous, persistent husks that are difficult to remove. The grain may vary in colour from light red to dark grey. The fibre content of the whole grain is very high. As with other food grains, the nutritive value of Kodo millet protein could be improved by supplementation with legume protein.



**Samai or Little millet** is another reliable catch crop in view of its earliness and resistance to adverse agro-climatic conditions of high drought as well as water logging. It is grown throughout India and a traditional crop of Karnataka. It has received comparatively little attention from plant breeders. The plant varies in height between 30 and 90 cm and its oblong panicle varies in length between 14 and 40 cm. It is mostly mix cropped with other millets, pulses and oilseeds. The seeds of little millet are smaller than those of common millet. It is generally consumed as rice and any recipe that demands staple rice can be prepared using little millet.

### **Akkadi**

'Akkadi'-mixed cropping system with finger millet is practiced widely. The popular combinations are ragi as a main crop is mixed with mustard, niger, field bean, castor, cow pea, red gram, sorghum and millets like foxtail, pearl and little millet. the benefits of intercrop for mixed crop is used to manipulate the system to deliver other eco-services such as nitrogen (N) supply where for instance a legume is used as an intercrop to fixate N that is used by subsequent food crops.

Mixed cropping ensures security in the event of monsoon failure and increases the returns from the land. It enhances nutrient availability, water holding capacity, with the numerous crop combinations.



Usually small farmers in Karnataka practice mixed cropping with a few combinations like with finger millet (ragi) and mustard ; groundnut, sorghum (jowar), pigeon pea (also known as red gram), cowpea ; finger millet, field bean and amaranth, castor (for oil purpose), sorghum, chillies. It is perceived as a viable tool to increase on-farm biodiversity and is potentially important component of sustainable cropping system. Apart from increasing total farm productivity, mixed species cropping can bring many important benefits such as improvement of soil fertility and suppression of pests and/or diseases.

## Popular Diversity

### Foxtail millet

Kari navane: this variety is cultivated as an inter crop or as a mixed crop with ragi. The plant grows to an average height and well suited for red soil. Ear heads are long and covered with black coloured awns (thorn like projections). Grains are black in colour.

Kuchu navane: Grows to a medium height and does not require much care. The ear heads are compact and resemble the tail of a fox. The variety yields well and is resistant to pests and diseases.

Kempu navane: Ear heads are long and red in colour. This is cultivated as a mixed crop with ragi. Ginnu (traditional recipe) prepared out of this is very tasty.

Jade navane: The ear heads are red in colour, long and in the form of a braid, so the name Jade navane. The crop is native to Bangalore rural district. It is drought resistant and free from pests and diseases. Cultivated as an inter crop with ragi.

Hullu navane: The ear heads are small in size with awns. Leaves are broad and yields good quality of fodder.

Halu navane: Popular variety of Koppa region. Grain coat is soft and seeds resemble that of dried straw. Dehusking process is an easy task. It is ideal for preparing uppittu and rice.

### Finger Millet

Pichchakaddi ragi - native to interior villages of Bangalore Rural District and grows luxuriously in rough terrain and hilly region. The ear heads are compact, and black in colour, resembling the shape of a fist.

Bili ragi - Native to old Mysore Region, Biligiri Rangana Betta Hills and can be cultivated in both irrigated and rain fed conditions. The special feature of this variety is that when the ear heads fully emerged the whole field looks white in colour.

Konana kombina ragi – As the name suggest the ear heads are long and resemble the horns of a Buffalo. The ear heads are slender and fully opened. The grains are hard and sturdy and are popular for its taste.

Kari kaddi ragi - A very popular variety in rural Bangalore, Kolar and Tumkur districts, for its high fodder yielding capacity and quality grain. It is still being cultivated with the high yielding varieties pouring in. This variety is resistant to pests and diseases and has the ability to withstand erratic rainfall.

Jenu gudu ragi - Ideal for both irrigated and rain fed conditions and it yields good fodder and grain. The grains are small sized. It is resistant to pest and disease attack.

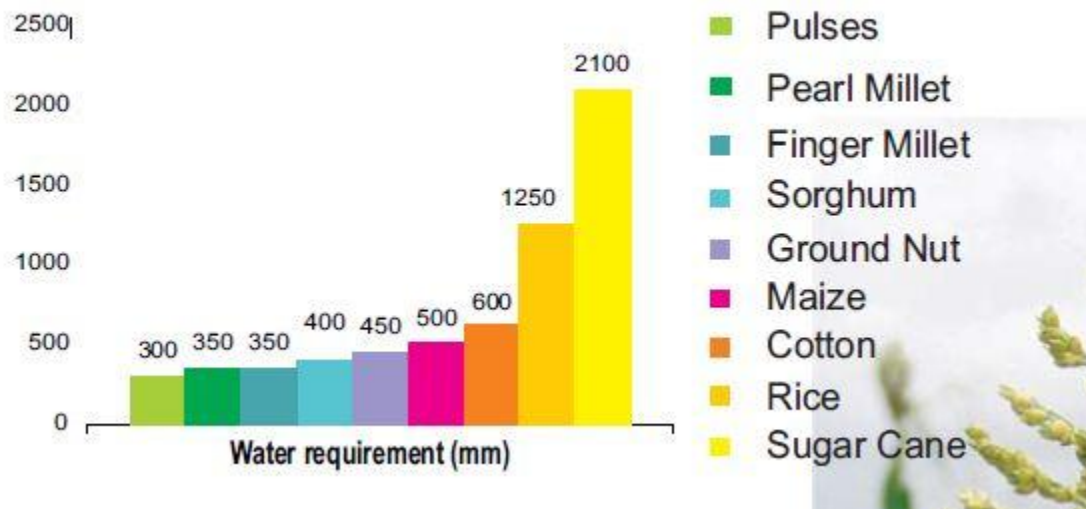
Karimunduga - When grains are about to mature, ear heads turn into attractive reddish blue colour and the ears are round in shape. The variety is ideal for irrigated areas and gives a good yield of fodder and grains. Though resistant to disease this variety cannot withstand drought.

Hasirukaddi ragi - it is a long duration crop of five months. The variety is resistant to drought. The ear heads are open with less number of tillers. Gives good quality fodder with a good yield. Suitable as an intercrop with pulses. It is commonly grown in Anekal Taluk of Bangalore Rural district.

**Agricultural relevance of Millets** – Both wild & cultivated varieties of millets are found in a variety of environments including the subtropical & tropical regions of the world. They have a relatively short growing season of 3 – 4 months. Their high genetic diversity & self – fertilization results in lower human input. Millets grow well in dry – land farming systems & respond well to irrigation. The small millets are especially adaptive ecologically, in that they grow well in a variety of soils including sandy soils or those with high acidity or alkalinity. With limited input, these species can survive in sub-marginal areas of limited rainfall (30-40 cm annually) & relatively high temperatures. Though field pests & diseases are a concern, the grain yield can be significant with minimal energy relative to the more traditional crops.

- One most significant importance of the millets, which present them as focus for the major agricultural research & development efforts, is their widespread adaptation in marginal production & niche areas. They provide farmers with the best available opportunity for reliable harvest, food & nutrition in environments with erratic & scanty rainfall, & low soil fertility levels.
- As millets can grow & thrive under difficult conditions, even producing some seeds in years with minimal rainfall, they have become an essential food in areas where the major cereals fail to give sustainable yields. In many instances, they have become a dependable & staple food of the poor.
- The small millets can also be stored longer, nearly 3 years. With good productive returns, little management, & high nutritional values, small millets are often the crop of choice for impoverished societies where labour is cheap & organized on a small scale. With these advantages, one would expect to find good evidence for millet use in the archaeological record.

### Comparison of Water requirements of Different crops (in mm)



Source – Millet Network of India – Deccan Development Society, FIAN, India

**Energy Efficient plants** - As world population grows, increased pressure on water resources becomes a huge problem, as extra food is required. Different plant species have traits that allow for improved utilization of the world's water resources. C4 plants are one such plant species that has a higher Water Use Efficiency (WUE). C4 plants (sorghum, maize and millet) represent about 5% of the Earth's plant biomass and only 1% of its known plant species. C4 plants improve carbon fixation over the simpler and more ancient C3. Millet is a so-called C4 plant, which has a very efficient photosynthetic system for capturing carbon dioxide, than the less efficient C3 plants. C4 plants concentrate more of carbon's

heavier isotopes compared with C3 plants. A C4 plant utilizes a more efficient form of carbon accumulation and improves the WUE enormously. C4 plants are able to achieve large yields within 4-6 months over summer as compared to many C3 plants that are not able to do this over a whole year. Breeding is currently underway to convert many C3 plants to the C4 genome, (rice in particular) due to improved WUE. Sorghum roots have a bio-fumigant effect helping to reduce certain soil pest like soil nematodes. C<sub>4</sub> plants have a competitive advantage over plants possessing the more common C3 carbon fixation pathway under conditions of drought, high temperatures, and nitrogen or CO<sub>2</sub> limitation. When grown in the same environment, at 30°C, C<sub>3</sub> grasses lose approximately 833 molecules of water per CO<sub>2</sub> molecule that is fixed, whereas C<sub>4</sub> grasses lose only 277 water molecules per CO<sub>2</sub> molecule fixed. This increased water use efficiency of C<sub>4</sub> grasses means that soil moisture is conserved, allowing them to grow for longer in arid environments.

**Finger, Pearl & Foxtail millet are highly efficient C4 plants.**

Milletts do not demand synthetic fertilizers & are pest free - Milletts do not demand chemical fertilizers. In fact, under dry land conditions, milletts grow better in the absence of chemical fertilizers. Therefore, most millet farmers grow them using farmyard manure under purely ecofriendly conditions. In recent years farmers have also started using biofertilisers such as vermicompost produced in their backyard and growth promoters such as panchagavya, amrit pani etc. These practices make millet production not only ecofriendly but stays under the control of farmers. Growing traditional local landraces and under ecological conditions, most milletts such as foxtail are totally pest free. And hence do not need any pesticides. Even in storage conditions, most milletts such as foxtail not only not need any fumigants, but act as anti pest agents to store delicate pulses such as green gram.

**Nutritional profile of milletts** – By any nutritional parameter, milletts are far ahead of rice and wheat In terms of their mineral content, compared to rice and wheat. Each one of the milletts has more fibre than rice and wheat. Finger millet has thirty times more Calcium than rice while every other millet has at least twice the amount of Calcium compared to rice. In their Iron content, foxtail and little millet are so rich that rice is nowhere in the race. While most of us seek a micronutrient such as Beta Carotene in pharmaceutical pills and capsules, milletts offer it in abundant quantities. The much privileged rice, ironically, has zero quantity of this precious micronutrient. In this fashion, nutrient to nutrient, every single millet is extraordinarily superior to rice and wheat and therefore is the solution for the malnutrition that affects a vast majority of the Indian population.

**Comparison of the nutritional components of milletts & the “Big” Cereals**

	Grain Type	Energy	Carbs	Protein	Fat	Dietary fiber	Ca	Fe	Thiamin	Riboflavin	Niacin
Small Milletts	Foxtail	351	63.2	11.2	4	17.62	31	2.8	0.59	0.11	3.2
	Barnyard	300	55	11	3.9	13.7	22	18.6	0.33	0.1	4.2
	Kodo	353	66.6	9.8	3.6	17.0	35	107	0.15	0.09	2
	Little	329	60.9	9.7	5.2	15.08	17	9.3	0.3	0.09	3.2
	Finger	336	72.6	7.7	1.5	18.8	350	3.9	0.42	0.19	1.1

	Common	364	63.8	12.5	3.5		8	2.9	0.41	0.28	4.5
Large Millets	Pearl	363	67	11.8	4.8	20.4	42	11	0.38	0.21	2.8
	Sorghum	329	70.7	10.4	3.1	14.2	25	5.4	0.38	0.15	4.3
Comparable grains	Wheat	348	71	11.6	2	12.9	30	3.5	0.41	0.1	5.1
	Rice	362	76	7.9	2.7	5.2	33	1.8	0.41	0.04	4.3

Source - FAO

### Vitamin profile of Millets

Millets	Vit A (mcg/100g)	Vit B6 (mg/100g)	Folic Acid (mg/100g)	Vit C (mg/100g)	Vit B5 (mg/100g)	Vit E (mg/100g)
Pearl	132		45.5	0.0	1.09	19.0
Foxtail	32		15.0	0.0	0.82	31.0
Sorghum	47	0.21	20.0	0.0	1.25	12.0
Proso	0		-	0.0	1.2	-
Finger	42		18.3	0.0	-	22.0
Little	0		9.0	0.0	-	-
Barnyard	0		-	0.0	-	-
Kodo	0		23.1	0.0	-	-
Amaranth				0.0	-	-
Rice	0		8.0	0.0	-	-
Wheat	64	0.57	36.6	0.0	-	-

### Micronutrient Profile of Millets

Millets	Ph (mg/100g)	Mg (mg/100g)	Na (mg/100g)	K (mg/100g)	Cu (mg/100g)	Mn (mg/100g)	Mb (mg/100g)	Zn (mg/100g)	Cr (mg/100g)	Su (mg/100g)	Cl (mg/100g)
Pearl	269	137	10.9	307	1.06	1.15	0.069	3.1	0.023	147	39
Foxtail	290	81	4.6	250	1.40	0.60	0.070	2.4	0.030	171	37
Sorghum	222	171	7.3	131	0.46	0.78	0.039	1.6	0.008	54	44
Proso	206	153	8.2	113	1.60	0.60	-	1.4	0.020	157	19
Finger	283	137	11.0	408	0.47	5.49	0.102	2.3	0.028	160	44
Little	220	133	8.1	129	1.00	0.68	0.016	3.7	0.180	149	13
Barnyard	280	82	-	-	0.60	0.96	-	3	0.090	-	-
Kodo	188	147	4.6	144	1.60	1.10	-	0.7	0.020	136	11
Amaranth	397	351	-	-	0.60	-	-	-	-	170	9

Rice	160	90	-	-	0.14	0.59	0.058	1.4	0.004	-	-
Wheat	306	138	17.1	284	0.68	2.29	0.051	2.7	0.012	128	47

### Essential Amino acid profile of Millets

Millet	Arginine (mg/g of N)	Histidine (mg/g of N)	Lysine (mg/g of N)	Tryptophan (mg/g of N)	Phenyl Alanine (mg/g of N)	Tyrosine (mg/g of N)	Methionine (mg/g of N)
Pearl	300	140	190	110	290	200	150
Foxtail	220	130	140	60	420	-	180
Sorghum	240	160	150	70	300	180	100
Proso	290	110	190	50	310	-	160
Finger	300	130	220	100	310	220	210
Little	250	120	110	60	330	-	180
Barnyard	270	120	150	50	430	-	180
Amaranth	560	121	301	59	273	236	111
Rice	480	130	230	80	280	290	150
Wheat	290	130	170	70	280	180	90

Millet	Cystine (mg/g of N)	Threonine (mg/g of N)	Leucine (mg/g of N)	Isoleucin (mg/g of N)	Valine (mg/g of N)
Pearl	110	140	750	260	330
Foxtail	100	190	1040	480	430
Sorghum	90	210	880	270	340
Proso	-	150	760	410	410
Finger	140	240	690	400	480
Little	90	190	760	370	350
Barnyard	110	200	650	360	410
Amaranth	-	275	403	211	241
Rice	90	230	500	300	380
Wheat	140	180	410	220	280

### Fatty acid Composition of Millets

Millet	Myristic	Palmitic	Palmoleic	Stearic	Oleic	Linoleic	Linolenic	Arachidonic
Pearl		20.85			25.40	46.0	4.10	
Foxtail		6.40		6.30	13.0	66.50		
Sorghum		14.0		2.10	31.0	49.0	2.70	
Proso			10.80		53.80	34.90		
Finger								
Little								
Barnyard								
Amaranth								
Rice		15.0		1.90	42.50	39.10	1.10	0.50

Wheat	0.10	24.50	0.80	1.00	11.50	56.30	3.70	0.80
-------	------	-------	------	------	-------	-------	------	------

Source - NIN

### Amylose & Amylopectin Content of Millets

Cereal grain	Amylose	Amylopectin
Sorghum	24 %	76 %
Pearl Millet	21.1 %	78.9 %
Proso Millet	28.2 %	71.8 %
Foxtail Millet	17.5 %	82.5 %
Kodo	24 %	76 %
Finger	16 %	84 %
Short Grain Rice	12 – 19 %	88 – 81 %
Wheat	25 %	75 %

### Health benefits

Lowers the risk of diabetes - Millets helps to lower blood glucose levels and improves insulin response. Besides, the magnesium present in millets is a co-factor in various enzymes involved in the secretion of insulin and metabolism of glucose in the body. Whole grains improve insulin sensitivity by lowering glycemic index of the diet by increasing content of fibre, magnesium and vitamin-E.

Glycemic Index is a scale that ranks carbohydrates by how much they raise the blood glucose levels compared to a reference food. Glycemic Index is based on the quality and not the quantity of carbohydrates. Millets have a low Glycemic index compared to most other cereals. Since millets have a low Glycemic index they increase satiety by decreasing hunger because it slows the rate of digestion. Type of starch (amylose/amylopectin) also influences the Glycemic index. Millets have a high amylose



content which is why they are slow absorbing and sustainably release sugar to our blood and enable to work for long durations.

Millets are a rich source of phosphorus which is an important mineral for energy production and is an essential component of ATP – the energy store of the body. It also forms an essential part of nervous system and cell membranes. A cooked cup of millet provides 26.4% daily need for magnesium and 24% daily need for phosphorus. Magnesium from millets also helps to relax blood vessels, enhances nutrient delivery by improving the blood flow and maintains the blood pressure and thus further protects the cardiovascular system. Millet is such a grain that should be included in the list of heart-healthy choices because of its status as a good source of magnesium. Magnesium increases insulin sensitivity and lowers triglycerides. It also acts as a co-factor for more than 300 enzymes. Lignans present in millets are converted to mammalian lignans and entero-lactone by the healthy gut micro flora in our body which is thought to protect against breast cancer as well as heart diseases.

Conserving millets is strategic in terms of their nutritional contribution and their role in local agro-ecosystems. Despite many obvious advantages, there has been a systematic fall in the output of millets in India. In the four decades between 1966 and 2006, while the total production of rice more than doubled (125%) from 38 million tones to nearly 86 million tones, and the output of wheat jumped threefold (285%), from just over 18 million tons to 70 million tons, the total production of all kinds of millets has actually come down by 2.4 per cent — from almost 18.5 million tones to below 18 million tones.

**Millet Myths** - Several myths affect the perceived nutritional and processing quality of sorghum. Many sorghums are tannin free, have about the same levels of phytin and phytic acid as maize and other cereals and the digestibility is only slightly reduced compared to maize. It is true that sorghum proteins are slightly less digestible than maize but as eaten in processed forms they are readily available and do not cause major problems.

**Mycotoxins** - Sorghum does not develop aflatoxins prior to harvest like maize does. Sorghum contains *Aspergillus flavus* and other species, but, apparently the exposure of the grain to the atmosphere prevents significant levels of aflatoxin formation in the field. Sorghum containing aflatoxin occurs during improper storage of high moisture grains. In addition, sorghum does not produce significant amounts of fumonisin. The relative resistance to field contamination of sorghum by these major mycotoxins is a major advantage for sorghum over maize. As maize is grown under more marginal conditions, the risk of increased levels of mycotoxins should be considered. Sorghum has less problems with mycotoxins. There is less information on pearl millet but it evidently does not produce significant levels of aflatoxins and fumonisins in the field either.

## **Millets in your kitchen**

### **Little millet Recipes**

Samai Dosa –1 cup Samme/Little millet, ½ cup black gram dhal, ½ cup puffed rice, 1tsp fenugreek seeds and salt to taste. Soak saame rice with fenugreek seeds and black gram separately for about 6 hours. Grind them together with puffed rice smoothly. Allow the batter to ferment overnight. Add salt to the batter and mix well. Pour the batter on to a hot tava to prepare dosas.

Samai Porridge – Saame/Little millet – 1cup, Coconut milk – 1 cup and salt to taste. Cook the rice in 4 cups of water and add coconut milk to it and boil and boil for another 10 mins, allow it to cool and serve with salt.

Samai payasam - Saame flour – 1cup, sugar – ½ cup, ghee – 1 tbl sp, condensed milk – 4 tbl sp, milk – 2 cups. Heat and roast ghee till golden brown in colour. Add milk and boil until the rice is cooked. Then add condensed milk and sugar to the cooked rice and boil for some time. Garnish with dry fruits and serve.

### **Foxtail millet recipes**

Navane sampali – navane ½ cup, sugar-1/4 cup, cardamom powder -1/4 tsp and cloves powder- ¼ tsp. Boil navane in 2 cups of water. Mash the cooked navane and add sugar and boil for a while. Then mix cardamom, cloves powder and serve with milk.

Navane huggi – Navane – 1cup, jaggery ½ cup, grated dry coconut, poppy seeds – 4tbl sp, cardamom powder – ½ tsp and cloves powder- ¼ tsp. In four cups of water add navane and allow to boil until navane is cooked. Add jaggery, cardamom powder, cloves powder and mix well and cook for a while. Take off the flame, allow it to cool, sprinkle grated dry coconut and poppy seeds and serve.

Navane burfi – navane – ½ cup, ground nuts – ½ cup, jaggery – 1 cup, grated dry coconut – 1 tbl sp, cardamom powder – ¼ tsp and Ghee- ½ tsp. Dry roast navane and grind into a fine powder. Heat jaggery in a pan, when it melts and forms a syrup of single thread, add navane flour, roasted groundnuts and all other ingredients. Mix well and transfer the mixture into a greased plate. When it cools, cut into desired shapes.

Navane kabab – navane – ½ cup, boiled potato – 2 big, boiled raw banana – 1, red chill powder – 2 tsp, coriander seeds powder – 2 tsp, cumin powder – ½ tsp, garam masala powder – ½ tsp, oil for frying and salt to taste. Pressure cook navane with 4 cups of water, mix with boiled and mashed potato and raw banana and other ingredients. Divide this mixture into balls, flatten slightly and deep fry.

### **Finger millet recipes**

Ragi ambali – thin porridge is prepared by soaking the flour overnight in water or butter milk and cooked next morning on slow flame. This facilitates mild fermentation and improves its flavor and taste.

Popped ragi flour mixed with jaggery and milk is relished in Karnataka and the sweet dish made is called hurihittu.

Ragi idli - Whole ragi grain- 1 cup, idli rice (parboiled) – 1 cup, Urad dal – ¾ cup, fenugreek seeds-1 tablespoon. Salt to taste. Soak the Ragi for a day. Drain and let it rest for another day till you see tiny white sprouts or soak for 3-4 hours. Separately soak rice and urad dhal. Then grind all the soaked ingredients till light and fluffy. Add salt to taste and leave it overnight to ferment. Next morning, grease

Idli moulds and steam in a pressure cooker for 12-15 minutes till done. Serve hot with chutney or sambhar.

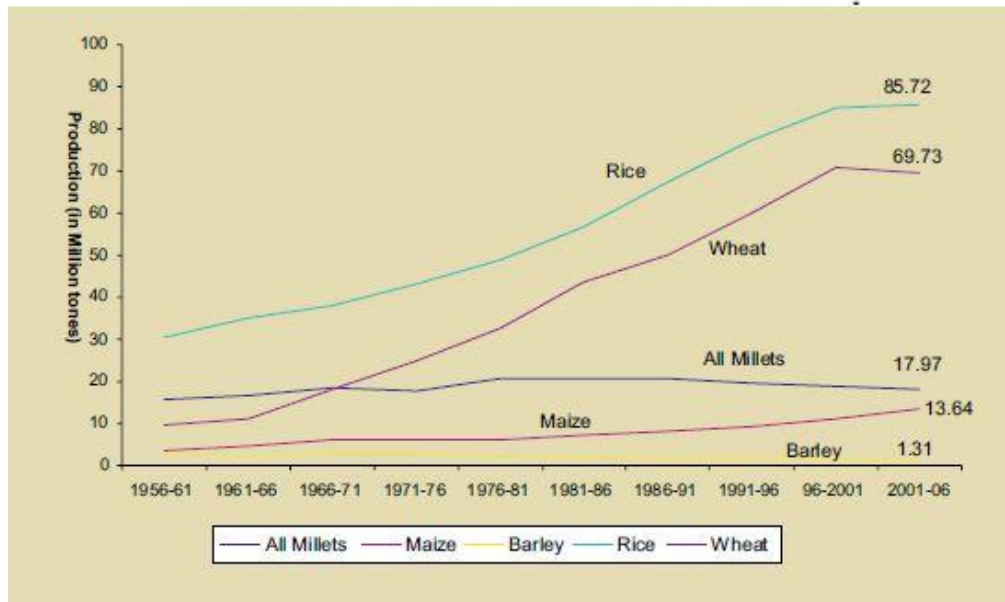
Ragi Halwa - Ragi Flour - 1 cup, sugar - 1 cup, crushed cardamom – 2, ghee - 6 tsp, fried cashewnuts. First mix the ragi flour with water and keep aside for 10 mins. Take a pan pour the mixture and add sugar, stir it well continuously. Add ghee and stir until it thickens like halwa. Once it thickens add cardamom, fried cashews and mix well.

To get a nutty flavor, dry fry the millet before cooking. Toast it in a pan without water over medium heat, stirring continuously for about 3 minutes until it releases a distinct aroma. Can be tossed into salads and vegetables.

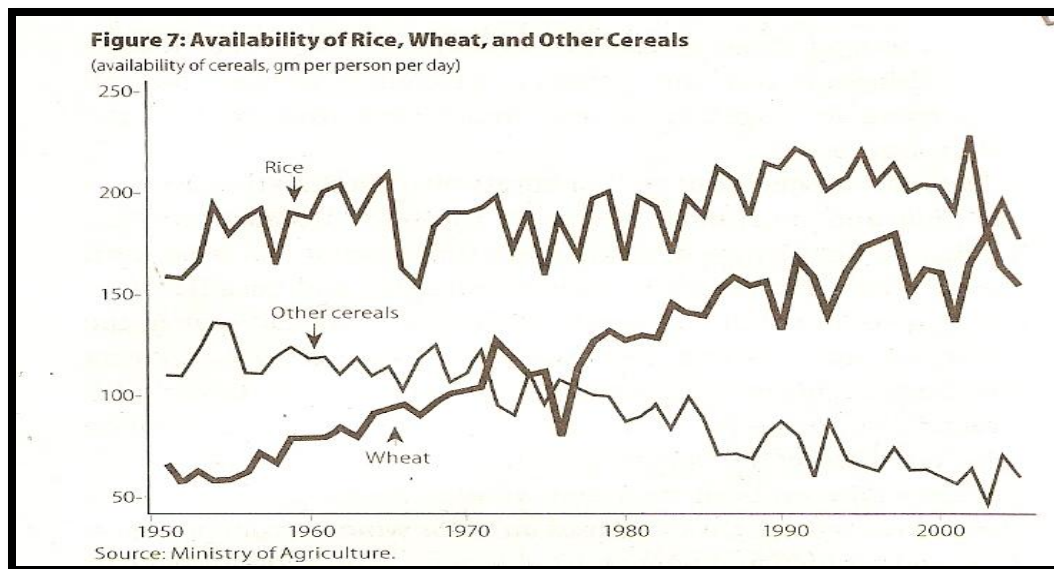
**Exclusion of Millets** – In spite of all these extraordinary qualities and capacities of millet farming systems, the area under millet production has been shrinking over the last five decades and rapidly, since the Green Revolution period. Between 1966 and 2006, 44% of millet cultivation areas were occupied by other crops signifying an extraordinary loss to India's food and farming systems. Declining state support in terms of crop loans and crop insurance has significantly contributed to this decline and fall of millets in Indian agriculture. Unless this is halted urgently through a slew of policy and financial incentives, millets might disappear from the agrarian landscape of India over the next fifty years. This will not only be a loss to India's food and farming systems, but will also prove to be a civilization and ecological disaster. The significance of these in the diet & in the civilization paled in comparison to maize, once domesticated maize became widely available. Some kinds of millets were replaced by wheat & barley that had been introduced by the Europeans. Replacement in India was basically because of crops that were included because they were more productive & for other social reasons. An intense spread of rice occurred since it was preferred for its taste & its high productivity under intensive cultivation. The larger picture is that there has been a decline of 47 % in millet consumption in urban India & 28 % in rural India for the past decade as per National Sample Survey Data (NSSD). Most common myth in Karnataka – eating Ragi makes you dark in color!

**Decline & fall of Millets** - Agriculturally, nutritionally and environmentally, it is quite tragic that we promoted wheat and rice to register a whopping increase of 285 and 125 percentage points respectively, state policies also allowed millets to suffer a decline of (-)2.4% after the Green Revolution in agriculture.

## Declining Production of Millets in Comparison to Rice and Wheat from 1956-2006



Source – Millet Network of India – Deccan Development Society - FIAN



The consumption of millets as rice or flour in the daily routine food though has several advantages; the millet grains may not be available in all cities, due to its increased price and decreased marketing strategy. The traditional way of consumption of millets has been restricted to remote and rural population, especially during certain festivals.

The health promoting factors of millets need awareness among mass and made available ready to eat or semi processed millet products for health benefits. The College of Rural Home Science, Dr Rama K Naik

and her team in the mega NAIP project have developed and standardized more than 300 millet recipes suitable to Indian pallet and also commercialized health based millet foods for diabetes mellitus, hyperlipidemia, gastrointestinal disorders, sports food and healthy breakfast food (cookies and flakes).

Let us save tradition, traditional cultivars & work towards enhancing production & economic returns to sustain livelihoods!

It is believed that Lord Indra while traversing through the fields came across his two dear souls – akki (rice) and ragi (finger millet) at loggerheads with each, as to who was superior to the other. So the Lord asked both to go and work till he asked them to stop working. When he finally summoned them back he was wonderstruck as ragi looked fresh and bright, while akki was wilting. But now their roles have reversed and ragi is wilting, while rice is flourishing, as it has become everyone's favourite.

Do not discard old traditions just because it is old!

**With best compliments from:  
NATIONAL BANK FOR AGRICULTURE AND RURAL DEVELOPMENT**

**MISSION: To Promote sustainable and equitable agriculture and  
rural prosperity through effective credit support, related services,  
Institution development and other innovative initiatives**

**MAJOR ACTIVITIES:**

- **Credit Functions** : Refinance for production credit (Short term) and investment credit (Medium and long term) to eligible Banks and financing institutions
- **Development Functions** : To reinforce the credit functions and make credit more productive, development activities are being undertaken through
  - ✓ Research and Development Fund
  - ✓ Soft Loan Assistance Fund
  - ✓ Agricultural and Rural Enterprises Incubation Fund
  - ✓ Rural Promotion Corpus Fund
  - ✓ Credit and Financial Services Fund
  - ✓ Watershed Development Fund
  - ✓ Kisan Credit Cards & Linking SHGs to credit institutions
  - ✓ Rural Infrastructure Development Fund
  - ✓ Farmers Technology Transfer Fund(FTTF)
  - ✓ Farm Innovation Promotion Fund(FIPF)
- **Supervisory Functions** : NABARD shares with RBI certain regulatory and supervisory functions in respect of Cooperative Banks and RRBs
- **We also provide comprehensive consultancy services relating to Agriculture & Rural Development.** ([nabcons@vsnl.net](mailto:nabcons@vsnl.net))



**NABARD**

**Head Office – Plot No. C-24, G – Block,**

**Bandra – Kurla Complex,**

**Post Box No.8121,**

*Bandra (E), Mumbai – 400 051*

visit us at : [www.nabard.org](http://www.nabard.org).

**TWENTY EIGHT YEARS OF COMMITTED SERVICE TO RURAL PROSPERITY**



Greeting's everyone!

It's me the Millet

For those who have forgotten me, it's time to rethink and bring back our lost traditional heritage. Rediscover my values, benefits and about how easily I can be a part of your daily lives.



An ISO 22000 Company

Pristine Organics Pvt Ltd,  
# 44/2A, Kodigehalli gate, NH7  
Sahakarnagar post,  
Bangalore – 560092  
Ph – 080-43438484,  
eco@pristineorganics.com



Sahaja Samrudha Organic producer  
Company Ltd  
No 569,Sajjan Rao Road, Near Trishal  
lodge  
V.V.Puram,Bangalore-560 004  
Ph: 080-26612315/ 7483088144  
Email: [info@sahajaorganics.com](mailto:info@sahajaorganics.com)  
[www.sahajaorganics.com](http://www.sahajaorganics.com)