

Potential crop: Hope for New Era

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Introduction

Potential crops are also known as underutilized crops, neglected and orphan crops. Neglected and underutilized species are those to which little attention has been paid or which receive low priority from agricultural researchers, plant breeders and policymakers. Out of an estimated global wealth of 80000 edible plant species only about 150 species have been widely used and of these, only about 30 species provide 90 per cent of the full for the world's population.

Potential crops are not traded as commodities. These crops are mostly grown in a particular areas and local environments and a lot of traditional knowledge are associated with them. Potential crops with their greater adaptability to extreme climatic conditions and resilience to biotic and abiotic stresses can be effective in curbing food insecurity. Potential crops are rich in nutritional values so they are valuable in fighting hidden hunger and malnutrition by improving the diets of human beings. Now agricultural production is focused on agrobiodiversity. It can contribute to harnessing and safeguarding centuries-old traditions and is powerful in keeping alive the cultural identity of farmers and indigenous communities. Potential crops have great untapped potential to support smallholder farmers and rural communities by improving their incomes and food and nutritional security. In order to increase yields and importance of Potential crops steps should be taken for the development of better varieties, improved cultivation practices, enhanced value addition technologies, a better access of producers to markets, validation and promotion of nutritional benefits, effective maintenance of genetic and cultural diversity on-farm, sustained capacity building of stakeholders and policy



support at the national and international levels sustainable conservation and use of Potential crops.

Why Potential crops are not widely known?

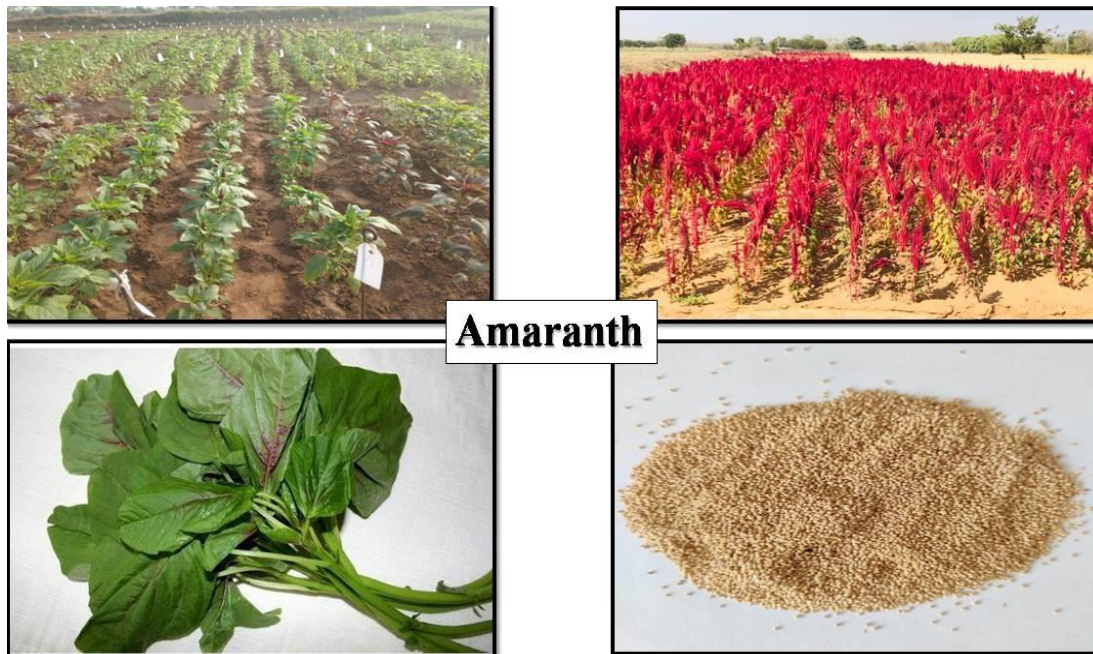
- Lack of knowledge and value addition technology of these crops
- Non-availability of germplasm/seeds/varieties for sowing and market for selling
- Limited improved agronomical crop production technology and less effective policies by the government
- The nutritional value of these crops are not known widely
- Lack of awareness in farmer communities and interest by researchers, agriculturists and extension workers

Amaranth

Amaranth species are cultivated as leaf vegetables, pseudocereals and ornamental plants. Amaranth seeds are a source of protein (13.56 g) and it has a high lysine (5.3 to 6.3 % of the protein) and sulphur amino acids content (3.4-4.0%). It is rich in content of dietary minerals, calcium, magnesium, phosphorus and potassium. In India, it is grown in Himalayas, Arunachal Pradesh, Madhya Pradesh, Gujarat, Maharashtra and South India. In Gujarat, the Amaranth crop is cultivated in 12000 ha estimated area in the year 2016-17. In Banaskantha district it is cultivated in 8200 ha estimated in the year 2016-17. Total of 93694 quintals of Amaranth grains was recorded at APMC, Palanpur (Prajapati *et. al.*, 2019). In Gujarat, it is grown on the borders of the field of lucerne or cumin or taken as a mixed crop with mustard and vegetables. Amaranth is grown as a sole crop in Banaskantha districts. The major market of Grain Amaranth in India is Palanpur, from where the grain is exported to other parts.

Health Benefits of Grain Amaranth

Amaranth helps in improving digestion, boosting the immune system, optimising metabolism, preventing heart attacks and controlling diabetes. Amaranth provides hair care, promotes the growth of muscles, anti-carcinogenic property prevents cataracts.



Buckwheat

Buckwheat (*Fagopyrum esculentum* L.) is a plant cultivated for its grain-like seeds and as a cover crop. Buckwheat is the most important crop in the higher Himalayas, where summer is the only growing season. It is the only food crop that can be grown in quick succession after pea, barley or wheat. Jammu Kashmir, Himachal Pradesh, Uttarakhand, West Bengal, Sikkim, Assam, Arunachal Pradesh, Nagaland, Meghalaya, Manipur, Kerala, Tamil Nadu and Chhattisgarh are the major Buckwheat growing states in India. It was regarded as a crop of poor soil, but the recent developments that the Buckwheat has its own potential for fixing atmospheric nitrogen will open up new vistas in the development of sustainable production systems in lower elevations as well. There is scope for Buckwheat to be widely utilized as a green manure crop to reclaim degraded land. Buckwheat is a rich source of protein (13.25 g), dietary fiber, B vitamins and several dietary minerals, with content especially high in magnesium, manganese and phosphorus. It is gluten-free, it may be eaten by people with gluten-related disorders, such as celiac disease, non-celiac gluten sensitivity or dermatitis herpetiformis.

Health Benefits of Buckwheat

Buckwheat prevents cancer, anaemia, heart disease and asthma. It improves digestion and bone health, boosts immunity, manages diabetes.



Buckwheat



Quinoa

Quinoa (*Chenopodium quinoa* L.) is a herbaceous annual plant grown as a crop preliminary for its edible seeds; the seeds are gluten-free, high in protein (14.1 g) and one of the few plant foods that contain sufficient amounts of all nine essential amino acids. It is also high in fiber, magnesium, B vitamins, iron, potassium, calcium, phosphorus, vitamin E, folic acid and various beneficial antioxidants. Another positive aspects of quinoa are the saponins found in the seed hull. Quinoa is one of the main food crops in the Andean mountains, but during recent times there has been an increased interest for the product in the United States, Europe, and Asia. In India, this crop is now grown in Rajasthan, Haryana, Andhra Pradesh, and Uttarakhand. Quinoa has been selected by FAO as one of the crops destined to offer food security in the next century. The United Nations General Assembly has been declared 2013 as the “International Year of Quinoa”. Quinoa also may be used as a break crop in crop rotations, because it is not susceptible to cereal diseases, and only slightly susceptible to soil-borne nematodes.

Health Benefits of Quinoa

Quinoa is very nutritious, high fiber, high in protein with all the essential amino acids, gluten-free and perfect for people with gluten intolerance. It is good for blood sugar control. It is also high in important minerals like iron and magnesium and high in antioxidants. Easy to incorporate into your diet.



Faba bean

Faba bean (*Vicia faba* L.) is a legume crop grown primarily for its edible seeds (beans). Faba bean is a major legume seed consumed by humans worldwide. The seeds of some varieties are an important livestock feed. Faba beans are also grown for fodder & green-manure legume. In India, Faba bean is cultivated in northern states during winter in plains and during the rainy season in hilly and mountains regions. Faba beans are grown as a sole crop and as intercropped or mixed crops.

Faba bean contributes to the sustainability of cropping systems through

Its ability to contribute nitrogen (N) to the system by biologically fixing N₂. Diversification of production systems leads to decreased diseases, pests and weed build-up, and potentially increased biodiversity. It provides food and feed rich in protein.


Faba bean

Table 1: Nutritional status of different crops (per 100 g seed)

Nutrients/ Minerals	Potential Crops			Cereal Crops		
	Amaranth	Buckwheat	Quinoa	Wheat	Rice	Maize
Energy (kcal)	371	343	368	327	364	364
Carbohydrates (g)	65.25	71.5	64.2	71.18	80	74
Fat (g)	7.02	3.4	6.1	1.54	0.7	4.74
Protein (g)	13.56	13.25	14.1	12.61	7	9.4
Calcium (mg)	159	18	47	29	28	7
Iron (mg)	7.61	2.2	4.6	3.19	0.8	2.71
Magnesium (mg)	248	231	197	126	25	127
Phosphorus (mg)	557	347	457	288	115	210
Potassium (mg)	508	460	563	363	115	28

Table 2 : Comparison of N-fixation of different leguminous crop

Crops	kg N/ha
Faba bean	80-200
Pea	50-150
Lentil	30-120
Soybean	40-140

Winged bean

Winged bean (*Psophocarpus tetragonolobus* L.) is also known as the goa bean, four-angled bean, four-cornered bean, Manila bean, princess bean, asparagus bean and dragon bean. It is a tropical herbaceous legume plant. It grows abundantly in the hot, humid equatorial countries of Southeast Asia. In Southeast Asia and New Guinea it is widely known but only cultivated on a small scale. In India, it is cultivated in Tamil Nadu, Kerala, Karnataka, Goa, Orissa, Maharashtra and West Bengal. Winged bean is widely recognized by farmers and consumers in southern Asia for its variety of uses and disease resistance. Winged bean is popularly known as “One Species Supermarket” for its nutrient-dense green pods, immature seeds, tubers, leaves, and mature seeds. Leaves can be eaten like spinach, flowers can be used in salads, tubers can be eaten raw or cooked, and seeds can be used in similar ways as the soybean. This underutilized crop has potential beneficial traits related to its biological nitrogen fixation to support low-input farming.

Health Benefits of Winged bean

It is high in protein, vitamins and minerals and contains healthy fats. It prevents premature skin, birth defects and DNA damage. It promotes skin elasticity, supports immunity, protects from anaemia and lifts mood.


Winged bean

Table 3: Nutritional status of different crop (per 100 g seeds)

Nutrients/ Minerals	Potential Crops		Pulse Crops			
	Winged bean	Faba bean	Pigeon pea	Chick pea	Green gram	Cow pea
Energy (kcal)	409	341	343	378	347	336
Carbohydrates (g)	41.70	58.29	62.78	62.95	62.62	60.03
Fat (g)	16.30	1.53	1.49	6.04	1.15	1.26
Protein (g)	29.65	26.12	21.70	20.47	23.86	23.52
Calcium (mg)	440	103	130	57	132	110
Iron (mg)	13.44	6.70	5.23	4.31	6.74	8.27
Magnesium (mg)	179	192	183	79	189	184
Phosphorus (mg)	451	421	367	252	367	424
Potassium (mg)	977	1062	1392	718	1246	1112
Sodium (mg)	38	13	17	24	NR	16
Zinc (mg)	4.48	3.14	2.76	2.76	2.68	3.37

Rice bean

Rice bean (*Vigna umbellata* L.) is a perennial legume crop. It is found in Indo-China, Southern China, Nepal, Bangladesh and India. Himachal Pradesh, Uttaranchal, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura, Madhya Pradesh and Chhattisgarh are major Rice bean growing states in India. These plants need an annual rainfall of 1500 mm and grow wonderfully in many types of soils. The dry seeds can be boiled and consumed with rice or they can be used in soups. Young pods are eaten raw or boiled. Young pods, leaves, seeds are boiled and consumed as vegetables. Rice bean is used as fodder for livestock and also use as a green manure crop. Rice bean is more-rich in protein (25.57%) than other types of pulses crops. People who have a weak digestion systems can consume this bean lavishly. Since the fat content is very low this bean is considered a well-balanced diet. This bean relieves oedema and the Chinese use this bean for medicinal purposes.



Rice bean



Spine gourd

Spine gourd (*Momordica dioica* L.) is commonly known as a spiny gourd, prickly carolaho, teasle gourd, Kantola and kankoda. It is a species of flowering plant in the Cucurbitaceae/gourd family. It is annual and mainly grown on the boundaries at a higher elevations. It is used as a

vegetable in all regions of India and some parts of South Asia. In India, it is cultivated in West Bengal, Karnataka, Uttar Pradesh, Orissa, Maharashtra, Jharkhand, Chhatisgarh, Gujarat and Meghalaya. In Gujarat, This crop is seen in Baroda, Junagadh, Banaskantha & Sabarkantha districts. In Banaskantha, mainly grown in Virampur, Ambaji, Danta taluka. The fruits are mainly available in the month of July-August. The fruits are cooked with spices or fried. It is propagated by underground tubers & sowing by Seed & Tissue culture Plant. It is dioecious, which means that it has distinct male and female individual organisms. Spine gourd is consumed by tribal groups living around the natural forest areas, especially at higher altitudes, where the native folks consume it as a daily vegetable.

Health Benefits of Spine gourd

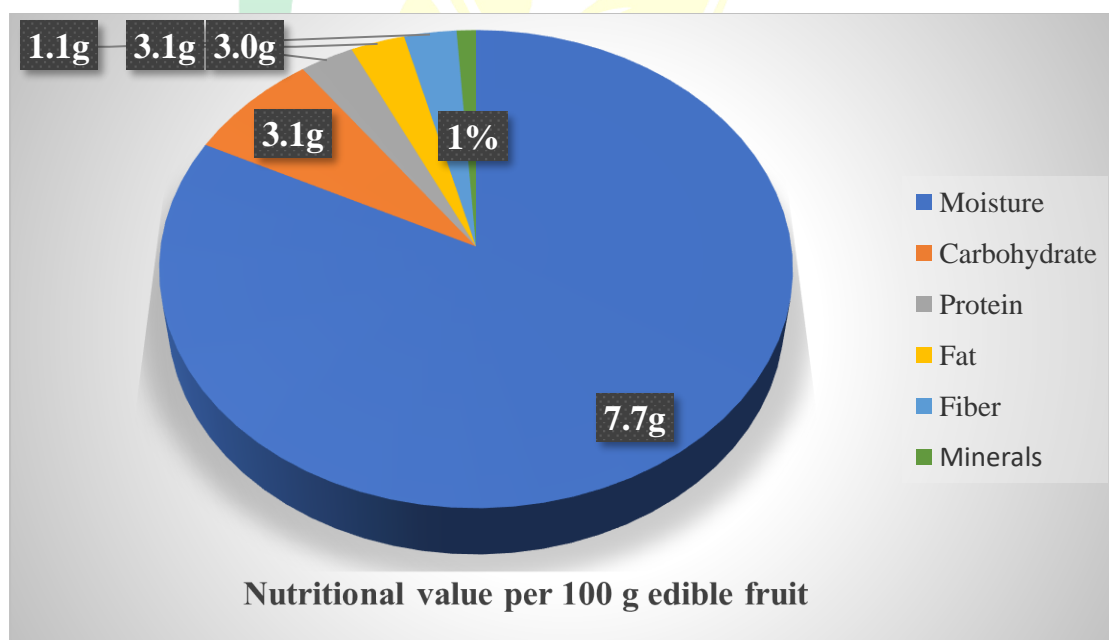
It is a great source of phytonutrients, a substance found in certain plants which are believed to be beneficial to human health and help prevent various diseases. The vegetable is also low in calories as it contains roughly 17 calories per 100 gm. Kantola is also high in water content, so is beneficial if you are trying to lose weight. As it is usually found during the monsoons, it is helpful in keeping seasonal cough, cold and other allergies at bay, due to its anti-allergen and analgesic properties. It also reduces blood sugar levels in diabetic patients since it is rich in plant insulin. Carotenoids, like Lutein, present in this vegetable help in the prevention of various eye diseases, cardiovascular diseases and even cancers. Being a source of vitamin C, a natural antioxidant, it removes toxic free radicals from the body reducing the chance of cancer. It helps to keep the skin healthy as it contains various flavonoids such as beta carotene, lutein and zeaxanthins that act as protective scavengers. “It also has anti-ageing properties as it is blessed with antioxidants that fight free radicals the body has due to ageing and pollution,” says the nutritionist. It is high in fiber and anti-oxidants and thus very useful for easy digestion and eliminates constipation.



Spine gourd



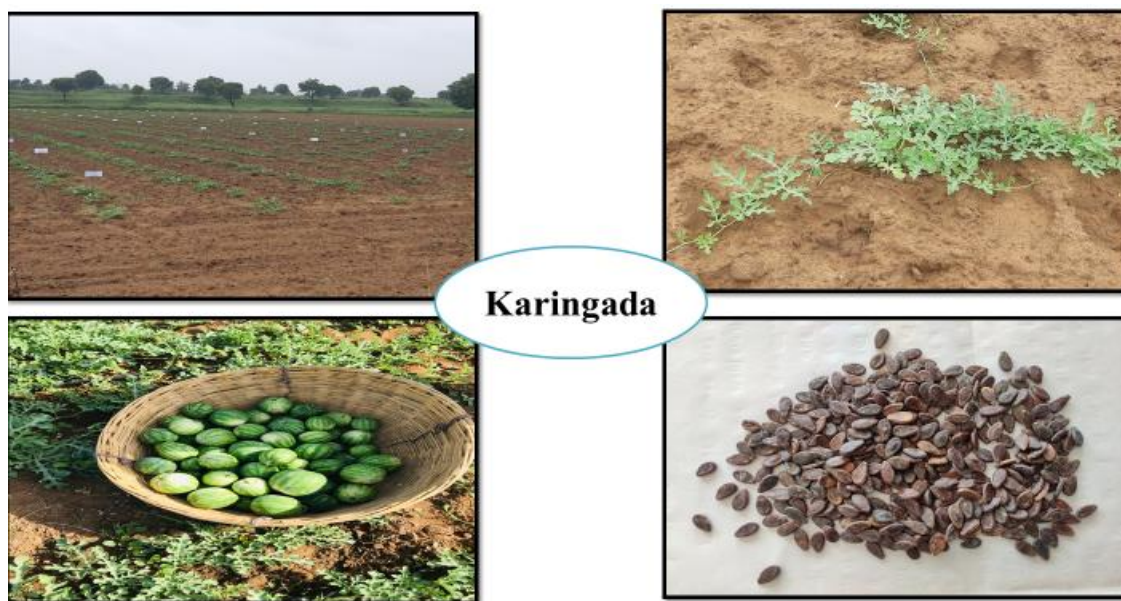
Spine gourd: Nutritional status



Karingada

Karingada (*Citrullus lanatus* L.) is an important drought hardy cucurbitaceous creeper. It is an important crop and has multipurpose values as food, oilseed, culinary, fodder etc. The crop is extremely cultivated in *kharif* and summer season. In India, Karingada is mainly cultivated

in Rajasthan, Gujarat and Hariyana State. In Gujarat it is cultivated in Banaskantha, Patan and Mehsana districts. This crop is grown on an estimated area of 3000 ha with an annual production of about 0.30 lakh MT of seed. (Prajapati, 2001). Karingada seeds contain more than 30 % protein and oil. Karingada fruit is used for vegetable purposes. Magaj is made from the seed of karingada which was used in a food product. The Karingada fruit weight ranges from 500 gm to 1.00 kg each. The karingada fruit contains solid pulp embedded with seeds.



Agronomical management practices for Potential crops

Time of Sowing

Time of sowing is the most important non-monetary input having a significant effect on crop growth & development, insect-pest and weed dynamics and crop productivity. The environmental conditions, viz. temperature, photo-period and moisture availability, etc. significantly changes with the time of sowing. Sowing dates depend on geographical location. Because of great variations in plant growth and bloom dates due to natural environmental conditions, sowing schedules cannot be determined on a national scale.

Spacing



Spacing is one of the most important factors for optimum plant population and their effect on crop yield. Every plant requires enough space for growth and development. When plants are too close to each other, they end up being overcrowded which later leads to more competition for resources then after it's resulted in poor crop yields.

Some of the reasons for proper spacing include;

It allows plants to develop to their full potential on top and underneath the ground. Adequate space ensures less competition for sunlight, water and nutrients.

Intercropping

Intercropping is growing two or more crops simultaneously on the same piece of land with a definite row pattern. It is the intensification of cropping in time and space dimensions. The most common goal of intercropping is to produce a greater yield on a given piece of land by making use of resources or ecological processes that would otherwise not be utilized by a single crop.

Nutrient Management

Nutrient management involves using crop nutrients as efficiently as possible to improve productivity while protecting the environment. The key principle behind nutrient management is balancing soil nutrient inputs with crop requirements. When applied in proper quantities and at the right times, added nutrients help achieve optimum crop yields; applying too little will limit yield and applying too much does not make economic sense and can harm the environment.

Irrigation Management

Water is precious, scarce input for crop production. The declining availability of irrigation water is great a challenge to the scientific community. Water productivity can be enhanced by the adoption of scientific irrigation management technology.

Weed Management



Weeds compete for nutrients, water, light and space with crop plants during the early growth period. Weeds increase the cost of production, harbour insect pests and diseases, decrease the quality of farm produce and reduce land value. Weed growth is minimized during the period of crop weed competition, crop yield will be equivalent to that of weed-free crop. Therefore, it is essential to control weeds by any means during crop weed competition.

