Indian farmers expand production and create new uses for vegetable soybean

Legumes are an essential part of the Indian diet, particularly for the large part of the population that are vegetarian. However, production is not keeping up with demand.

The rapid growth of vegetable soybean production in India over recent years shows it is popular with farmers and consumers alike. Vegetable soybean is a large seeded and sweet type of soybean that has been consumed as a fresh vegetable for centuries in East Asia, but until recently was virtually unknown in India. In contrast, grain soybean grown for oil and meal is the largest legume crop in India with annual production of around 6 million tonnes.

Expanding adoption of vegetable soybean is a key feature of the AVRDC project “Improving vegetable production and consumption for sustainable rural livelihoods in Jharkhand and Punjab, India” supported by the Sir Ratan Tata Trust (SRTT). Implementation began in 2008 in conjunction with six NGO partners in the Ranchi and Khunti districts of Jharkhand and with support from the local Indian Council of Agricultural Research (ICAR) station. Spectacular growth in local production since then, and unexpected uses of this highly nutritious crop by young farmers show vegetable soybean has an important future.

Vegetable soybean seeds are traditionally eaten green. Immature pods are boiled and the extracted seeds serve as a highly nutritious snack food. Vegetable soybean seed has up to 38% protein and 7% lipids with high levels of healthy monounsaturated fatty acids.

It also has high levels of vitamin C and vitamin E and is one of the few natural sources of anti-cancer isoflavones.

The most common fresh legumes eaten in India are green peas, but vegetable soybean can provide a more nutritious alternative—and at a different time. Vegetable soybean has almost double the protein and six times the energy content of green peas, with 60% more calcium and twice the phosphorus and potassium levels but similar levels of iron and vitamins B1 and B2. While green peas are available only in the cool season, vegetable soybeans are picked in October—a festival month in Eastern India when few other legumes are available and prices are high.
Mr. Khudiram Munda, a 31-year old farmer from the tribal village of Uludih near Ranchi in Jharkhand is typical of many new vegetable soybean growers. He sowed 4 kg seeds provided by AVRDC in July 2010 in a 400 m² field. He was able to harvest 250 kg of green pods about 80 days later and sold them to four nearby local markets for INR 20/kg (US$0.37/kg).

Mr. Munda’s family consumed the green vegetable soybean seeds either fried or boiled like green peas – and even the children liked this new food. However, they also found the dry seeds could be very tasty if soaked overnight to remove the seed coat, then fried along with ginger, garlic, turmeric and other Indian spices and eaten with boiled rice. He has kept enough seeds for the next planting. Vegetable soybean has become an important source of income and food for his family.

Vegetable soybean is a new crop for India. The first varieties suited to local conditions were identified in 2001, and introductions of AVRDC lines led to the release of the variety ‘Swarna Vasundhra’ in 2008 by the ICAR research station in Jharkhand. Vegetable soybean is a hardy and successful rainfed crop for sowing in June and July. It has low labour requirements and is well suited to the sandy and often shallow soils of Jharkhand.

‘Swarna Vasundhra’ has been the mainstay of the crop’s expansion to date. In the first year of the AVRDC-SRTT project, seed was distributed to 60 farmers, and the crop was widely promoted through field days and training events. In the second year, 470 farmers grew the crop. They learned to sow the crop on ridges before mid-August to avoid waterlogging and to weed and top dress the crop for best yields. By the third year more than 3000 farmers were growing vegetable soybean and by the fourth year demand from 50,000 farmers for seed greatly outstripped available supplies.

Vegetable soybean not only tastes good, but the SRTT survey found that more than 70% of farmers were impressed with its yields. The nitrogen the crop produces can also benefit subsequent crops. Taking these factors and the value of seed sales into account, SRTT estimated that net income can be increased by around INR1700/kg (US$31.5/kg) of seed planted in a 400 m² field.

As a part of our ongoing work AVRDC is testing 16 new lines of vegetable soybean in multilocational trials across India, with a wide range of seed colors and qualities. Many lines have a ‘basmati’ rice flavor—a popular and premium taste that commands a high price. Two new high yielding varieties are ready for official release.

The main need now is to increase vegetable soybean production to a level beyond that which can be absorbed by local markets, and to promote it in the wider community to create a strong and permanent demand for this new crop. The pioneering farmers of Jharkhand have shown it has a great value to them and with more support it can have a much wider impact in improving incomes and nutrition in India.

Source and photos: Warwick Easdown, Regional Center for South Asia and M. Ravishankar, Research Site Coordinator, Jharkhand, AVRDC-The World Vegetable Center
Spiny bitter gourd (*Momordica cochinchinensis*) is a tropical cucurbit that is indigenous to Southeast Asia, where it is widely used as food and traditional medicine. It is known by different names in various Asian countries such as “gac” in Vietnam, “fak kao” in Thailand, “mak kao” in Laos, “moc niet tu” in China and “bhat karela” in India. The species name “cochinchinensis” derives from the Cochinchina region in the northern part of Vietnam. Vietnamese consume the red seed pulp (aril) of the ripe fruit as part of “Xoi gac” (red rice) and discard the yellow mesocarp portion.

Gac is a perennial climber and one plant produces 60-70 fruits in a season. Fruits weigh 0.6-2 kg, are ovoid and covered with 3-4 mm long spiny tubercles. They turn orange or red at maturity. The dark brown sculptured seeds are covered with red flesh. There appears to be lack of awareness of the potential health value of gac. The mature fruit abounds in antioxidant phytonutrients, including lycopene, beta-carotene, lutein, phenolic acids and flavonoid. A 'functional drink' prepared from gac fruit has hit the Thai market very recently.

Mr. Rattana Charntawong, a Thai farmer in Nakhon Pathom province of Thailand takes pride in commercially farming gac over 8 ha. He owns a two-room factory for preparing juice from the yellow and red portions of gac fruit. The bottled juice contains 20% gac, 17.5% pineapple, 7.5% passion fruit, 7% sugars and 48% water. Six people work in his modest factory. He started planting gac in 2007 and initiated factory operations in 2008. He grows local varieties with oval or round fruits in his fields. One hundred thirty-three vines are

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*Mr. Rattana Charntawong (left) with Narinder Dhillon, AVRDC Cucurbit Breeder, in gac field.*

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*Flowers (left), mature fruit (middle) and seeds (right) of gac.*
planted in one rai (=1600 m²) with spacing of 3 m between rows and 4 m between vines. Vines are pruned in January and flowers appear in February. Fruit is harvested from April to August. The fruit yield is 7.5 t/ha in the first year and increases to 12.5 t/ha in subsequent years. Vines thrive up to 100 years!

So far, there are 10 farmers growing gac to supply Mr. Rattana’s factory. Farmers earn US$40/100 m² (gross income) in the first year and US$80/100 m² in each subsequent year. Their expenditure on the gac field is US$30/100 m² in the first year, which reduces to US$12.5/100 m² in each subsequent year.

Mr. Rattana has sold 462,000 juice bottles (180 ml/bottle) from January to August 2012 and he plans to sell one million bottles in 2013. He sells juice bottles by himself and distributes to the Thai Royal Project, Golden Place and Joy Mart, and these agencies market the juice to other areas of Thailand. The retail price of one bottle of juice is THB 35 (US$1.12).

Gac is dioecious, and female and male plants should be planted in 9:1 ratio. In current local varieties of gac, yellow mesocarp and red seed pulp account for 50% and 25% of fruit weight, respectively. Growers hope that breeders can develop gac varieties with equal quantities of yellow and red fruit components—red pulp without seeds will be ideal! Dr. Patcharin Songsri, a researcher from Khon Kaen University in Thailand, has started breeding work on this species.

Mr. Rattana claims 30% profit in this business. As a result, some farmers and factories located in Chonburi, Chiang Mai, Bangkok and Samutprakarn follow Mr. Rattana’s procedures for planting gac and producing the fruit juice. Gac is now cultivated throughout in Thailand.

Source and photos: Narinder Dhillon, Cucurbit Breeding; Narin Senapa, Vegetable Research and Training, AVRDC – The World Vegetable Center, East and Southeast Asia, Thailand
Vegetable cultivation in the monsoon season in Bangladesh

New varieties of ‘prince shak’ (left), heat-tolerant country bean with elongated pods with purple edges (middle) and green pods (right) developed by BRAC Agriculture Research & Development Centre, are now being cultivated by farmers and can be easily grown in the rainy season.

With the increasing demand for vegetables in Bangladesh, vegetable cultivation has become a popular agricultural enterprise in recent times. In Bangladesh most of the vegetables are cultivated in the rabi (October to February, the cool season) and kharif-1 (March to May) seasons. In the monsoon season (July to September), the vegetable supply in the market is very limited and appropriate technologies are lacking for growing vegetables.

Based on observations at BRAC Agricultural Research & Development Centre, nine vegetable crops were recommended for planting during the monsoon season, including prince shak (Corchorus olitorius), pechay/batishak (Brassica rapa), leafy mustard (Brassica juncea), laffa sak (Malva verticillata), spinach (Spinacia oleracea), bitter gourd (Momordica charantia), ash gourd (Benincasa hispida) and country bean/hyacinth bean (Lablab purpureus). Most of these crops are grown sporadically by Bangladeshi farmers during the rainy season.

Prince shak (jute mallow) is very similar to jute and it is locally called “piring shak” or “marah shak”, which is available in northern Bangladesh. Prince shak can withstand excessive soil moisture and can be cultivated easily in the monsoon season all over Bangladesh. It is hardy and can tolerate temporary waterlogging after heavy rainfall. It is a nutritious vegetable and its taste is similar to jute leaves. The newly developed variety can be cultivated as an ornamental plant alongside the kitchen garden in the monsoon season.

Pechay, leafy mustard, laffa sak (cluster mallow) and spinach are usually grown in the rabi season but these leafy vegetables can also be cultivated in the later part of the monsoon season (mid-July to September) by planting them on 5×1 m raised beds under low-cost polyethylene tunnels. Seeds of those leafy vegetables can be sown directly into the beds and can be harvested within 30-35 days for sale in the market.

Bitter gourd, ash gourd, country bean and yard-long bean can withstand relatively high amounts of soil moisture. Seedlings of bitter gourd and ash gourd are raised in poly bags and can be transplanted to the raised beds in the field after 24-25 days. This ensures very good production of ash gourd and bitter gourd before the rabi season.

Country bean can be easily grown in the rainy season, even in the peak monsoon period, as it has a very high capacity to tolerate waterlogging. The new heat-tolerant varieties developed by BRAC have good fruit setting in summer and can be harvested from May to September, and even throughout the whole winter if well maintained. Its market price in monsoon season and early winter is high.

Laffa sak (left), pechay (middle) and leafy mustard (right) can be planted on raised beds under polyethylene tunnels in the rainy season.
Red (left) and green (right) types of yard-long bean are very common in Bangladesh.

Yard-long bean can tolerate relatively high amounts of soil moisture. Suitable varieties of yard-long bean can be easily grown in raised beds. Green and purple types are very common in Bangladesh, and the whitish green type is now being cultivated sporadically. All three types can be easily grown on raised beds throughout the monsoon season with moderate yield.

Growing vegetables in the open field in the monsoon season is very difficult as most of the vegetable crops cannot tolerate excessively high soil moisture. However, constructing low-cost polyethylene tunnels and growing vegetables under tunnels is an option for the rainy season. The cost for polyethylene tunnels, including bamboo sticks and polyethylene sheet, is around US$10 per decimal (=40 m²).

 Besides growing vegetables under polyethylene tunnels, trellises can also be constructed for growing pumpkin. In Bangladesh, pumpkin is traditionally grown on beds in the open field in the dry season. Setting up the trellis to grow pumpkin in the beginning of the rainy season can ensure a good harvest. In addition, pumpkin can be stored at least 5-6 months after harvesting, which can extend its availability in the market up to November.

Farmers usually do not have many income opportunities in the rainy season; however, by growing selected fast-growing vegetables under tunnels and on trellises, and selling the produce, they can indeed generate good profits.

Source and photos: Sitesh Chandra Biswas, Vegetable Research, BRAC Agricultural Research & Development Centre, Bangladesh