



Agriculture

People are becoming increasingly aware of what they eat, how they eat and how the food is being grown or harvested. This has inspired some out-of-the-box thinking by communities as well as by the government. We explore some of these ideas that are fast catching up.

Through the roof

SUGANDH PRIYA OJHA AND M SUCHITRA



WHAT

Rooftop farming has started to put down roots in urban India. All sorts of riveting experiments are taking place as food plants blossom on terrace gardens

WHO

City-dwellers determined to grow their own organic vegetables and fruits

WHY

Concerns about chemical contamination of food bought from the market and the sheer joy of growing plants

The roof of a bungalow in Delhi's upmarket Greater Kailash locality is teeming with gardening enthusiasts, among them students and professionals. It houses the office of Edible Routes, a farming consultancy with around 40 clients across Delhi.

Experts say there has been an increase in the number of urban households growing vegetables for everyday consumption, but most need help in growing and maintaining the plants. Entrepreneurs have now started providing these services to urban customers. Edible Routes,

for instance, charges ₹2,000 per month and provides clients with fertiliser, cow dung biscuits, natural pesticides, pots and a gardener. The consultancy was started by Kapil Mandawewala, a management graduate who worked with Deloitte in the US before returning to his hometown in Jamnagar, Gujarat, in 2010. His interest in the agri-business fructified as SajeewFresh (now Edible Routes). "We don't know where the food we eat is grown or what chemicals are used to grow it," he says. He moved to Delhi in 2014 to start the business. With a total investment of ₹10 lakh, he started supplying fresh, organic vegetables to consumers

PHOTOGRAPHS: VIKAS CHOUDHARY / CSE



Edible Routes organises a weekly workshop in Greater Kailash, Delhi, where enthusiasts can learn how to grow vegetables on rooftops.



A R S Vadhyar, a civil engineer who has created a green paradise on his terrace in the heart of Ernakulam feels that city-dwellers, with their busy jobs, often complain that they don't have time and space to grow anything. He leads by example to show how simple rooftop farming is

and held workshops on terrace farming. He has employed 15 people, including three gardeners, who are paid ₹10,000-12,000 per month. Kapil says he is happy with the money he is making.

Edible Routes has devised several interesting techniques for growing vegetables. For instance, they grow three-four plants in a single pot which helps the plants acquire each other's properties. "Growing basil and tomato in the same pot makes the tomatoes sweet," says Fazal Rashid, who works for Edible Routes. They have also designed special pots with holes centimetres above the bottom to let out excessive water, while the base is filled with coco-peat. This allows plants to be watered only once every 15 days.

Down south, Kerala faces two serious issues: shortage in production of vegetables and fruits, and chemical contamination. Kerala's annual requirement of vegetables is three million tonnes. With high levels of literacy, Keralites have been increasingly moving away from farming and purchasing almost everything from the markets. "Despite having good rains and sunlight, the state produces only 30-40 per cent of its requirement," says K Prathapan, director, State Horticulture Mission, which has been promoting organic vegetable farming. The rest is imported from the neighbouring Tamil Nadu and Karnataka. "The state has a high cancer incidence rate and one of the reasons for this could be chemical contamination of vegetables and fruits," says Lal Varghese Kalpakavadi, chairperson of the state-owned vegetable procurement agency, Kerala Horticultural Products Development Corporation. He adds that regular tests of vegetable and fruit samples from the markets reveal high levels of chemical residue.

But you wouldn't know it if you paid a visit to

70-year-old A R S Vadhyar's terrace. Vadhyar a civil engineer, has created a green paradise on his rooftop. Three big coconut trees, 35 banana trees, papayas, guavas and chickoos, grapes with bunches of green fruits hanging, yellow-green pumpkins, light-green ash gourds, whitish-green snake gourds winding their way down from a pandal, lush foliage of dark-green bitter gourds, tender okra, drumsticks, tomatoes, many varieties of beans and tubers such as yam and tapioca, turmeric, garlic and ginger. All on a terrace of a four-storey building amid high-rises at the busy Convent Road in Kerala's Ernakulam city, the business capital of the state. The garden even has a small lotus tank, and a vermicomposting facility.

"City-dwellers with their busy jobs often complain that they don't have time and space to grow anything. But we have been successfully doing rooftop farming for the past 15 years," says Vadhyar. When Vadhyar started terrace farming, many thought he was crazy. But now a large number of people in cities and towns of Kerala are growing fruits and vegetables without using chemical fertilisers, pesticides and insecticides. Those who take up terrace farming are not regular farmers, but professionals such as engineers, doctors, employees from the public and private sectors, senior citizens, women homemakers and students. "There could be a minimum of 20,000 rooftop cultivators in each of the 14 districts in the state," says Prathapan.

While people like Vadhyar and Abhilash P T, an engineer with Tata Consultancy Services in Ernakulam, grow vegetables in specially-built spaces on their terraces, a majority of terrace farmers grow vegetables in plastic "grow bags" which



Greenish, a Delhi-based nursery, does beautification for hotels and offices too

are available at Krishi Bhavans under the state agriculture department and also at private outlets. "These bags are standardised for ultraviolet rays. So they last for at least 4-5 years," says Joji Mathew, an engineer from Thiruvananthapuram, who practices rooftop farming.

The bags come in different sizes and filled with a mixture of top soil, cow dung, river sand or Laterite powder, coir pith and *Pseudomonas*, a biopesticide, in equal proportion. All these components are available in government agro-bazaars. They became popular in Kerala in 2010 when the Horticulture Mission distributed thousands of such bags with a variety of plants and a guide free of cost. In Thiruvananthapuram city alone, over 33,310 households were each given 25 such bags and plants. "We are sure 60 per cent of them are continuing with rooftop farming," says Prathapan. Now, 25 bags with the soil mixture are sold at a subsidised rate of ₹500.

Many like R Raveendran, a resident of Ulloor in Thiruvananthapuram, and A K Mathew, resident of Kakkanad in Ernakulam and former general manager of Hindustan Insecticide Limited, make the mixture on their own. "The solution can be prepared by spending just one-tenth of what you would spend for buying organic manure," says Raveendran, who got the Innovative Farmer Award in 2014 from the Indian Agricultural Research Institute.

Rooftop farming initiatives have mushroomed in other cities like Bengaluru and Mumbai. Squarefoot Farmers, a Bengaluru-based company, helps clients to set up two types of urban vegetations—completely "edible" farms (having vegetables, fruits and herbs) and "landscaped" gardens (where herbs and fruit trees are entwined into the landscape with aesthetics as the focus).

Owners of the company, Vishwas Makam and Arun Gundmi, were fascinated by the farm life, which drew them to the business. They now have a team of seven and organise workshops and set up gardens in Bengaluru and nearby cities. "We want to show that one can make money in this sector. All you need to know is the right direction to target customers," they say.

Squarefoot Farmers charges its clients ₹500-1,100 per sq m for plantations on soil and ₹3,300-11,100 per sq m for landscaped garden on pots. Clients can avail watering solutions, gazebos and tensile roofing, furnishings and lighting facilities. The company also make pots in different shapes and sizes from materials like pine wood, coir, PVC, CorTen steel (weathering steel) and stainless steel.

A similar initiative is iKheti. Started in Mumbai by Priyanka Amar, an MBA graduate, iKheti claims to "create a platform for both individuals and communities to grow healthy, consumable crops within their premises and promote sustainable urban farming". Apart from providing consultancy, raw material and maintenance and gardener services, iKheti also does beautification and green-vamping of rooftop and patios. Their clients include individuals, residential societies, corporates and educational institutes. Talking about her business, Amar says she started with an initial investment of ₹75,000 in 2011 and it took her two years to break even.

The company charges its clients ₹2,000-4,000 for a herb garden on the terrace, while a mix of herbs, vegetables and fruits costs ₹2,500-12,000. The cost of raw materials is included in this.

Jaipur-based Living Greens provides farming techniques that are pesticide-free and organic. They help farmers grow vegetables using a fraction of the water used in normal farming. The company charges ₹13,500 for a portable rooftop organic farming unit of 40 sq ft (₹3,750 per sq m) and provide bio-pesticides, pot mixtures and grow bags. They also make follow up visits for maintenance. They use only 20 litres of water to grow 1 kg of vegetable.

"We cannot share our margins with you but we can tell you that despite being a two-year-old start-up, we are breaking even most of the months," says Prateek Tiwari, founder and CEO. He works with a team of 19 people and has around 130 customers. Recently, the company's business model was selected among the top eight agri-business models by the Agri Food Business Accelerator, a joint venture of the IIM-Ahmedabad and the National Academy of Agricultural Research Management.

Apart from these somewhat expensive services, there are cheaper options available too. For instance, Hariyali, a nursery in Hauz Khas, New Delhi, provided gardeners at a monthly cost of ₹800-1,000. Ravindra Ahuja, who owned the nursery, ran it for the past 25 years. Currently, the place is being run by his daughter, Saniya, and has been re-christened Greenish. They have also started providing other services such as laying beautification patches in hotels and offices. Their clients include the Australian High Commission, the Oberoi Hotel, Moolchand Medicity and MNCS like Larsen & Toubro.

The idea of such agri-business initiatives is fast gaining acceptance. Delivering a lecture at the Administrative Staff College of India, Hyderabad, Sanjeev Chopra, joint secretary, agriculture ministry, said, "It's time that agriculture in urban areas is promoted. Governments and institutions should focus on this. Agriculture is no more just a rural affair. The priority should be to use the available infrastructure in urban areas".

Fishing in troubled waters

KUNDAN PANDEY



WHAT

Aquaculture is gaining popularity in Jharkhand thanks to some brilliant out-of-the-box thinking of the government and people's enthusiasm

WHO

Locals in some of India's poorest and most backward districts like Koderma, Chatara and Seraikela Kharsawan

WHY

The state has limited water bodies, but over 70 per cent of the people are fish eaters

Affluence is not a word one would normally associate with Jharkhand's Jamukhadi village, which falls in one of India's 250 most backward districts. But almost all the houses in the village have TV sets, computers and motorbikes. "There were only a few pucca (brick) houses in our village till 2000 when the state was created. Today, 80 per cent of the houses are pucca," says Rameshwar Paswan, a proud resident of the village in Koderma district. He also owns a truck and two pokland machines that he bought with friends for soil excavation. Paswan's story depicts the meteoric growth the village has witnessed in the recent past. Till 2013, he was a labourer who would occasionally catch fish from the Tilaiya dam reservoir in the district. "Today, I do commercial fishing in the dam and earn over ₹16 lakh a year," says he.

Like Paswan, more than 88,000 people across the state are reaping profits through aquaculture; and this has been possible because of the state government's decision to popularise commercial fishing. Starting 2007, the state fisheries department has launched a series of initiatives to attract individuals and communities with water bodies to aquaculture. The decision was taken because the state, which has a huge fish-eating population, imported bulk of its fish from Andhra Pradesh and other states. "Over 70 per cent of the state's population eats fish. So we thought of popularising fishing in the state," says Rajiv Kumar, director, Jharkhand fisheries department. The impact of the initiatives is visible. Jharkhand doubled its fish production to 106,430 tonnes between 2006-07 and 2014-15. It is expected to reach 120,000 by 2016. The state has also increased its capacity of fish seed production, which is in shortage in the country. Jharkhand doubled its fish seed industry to ₹110-crore between 2007 and 2015.

Involving local communities is one of the primary reasons behind the success," says Kumar. He adds that Jharkhand, unlike neighbouring Bihar and West Bengal, has limited water bodies. Most of them are either privately owned or managed by communities; 85 per cent of the

water tanks are privately owned.

With this in mind, the state launched the Matsya Mitra initiative in 2007 which invites village residents to join hands with the fisheries department and promote aquaculture. For aquaculture, it is necessary to know the pH scale and content of organic carbon in the pond water and the soil in the surrounding area. The initiative members, called Matsya Mitras, collect these vital information, and in case of an anomaly, instruct farmers to solve the problem. The state has over 3,600 Matsya Mitras who are now helping district fisheries officers in resource assessment, documentation of farming practices and in sourcing of support services. "They have also helped in identification of coal pits, small ponds and wells that are not being used for fish farming. Aquaculture activities have been started in several tanks because of the scheme," says Kumar.

Nicolas Bando, Matsya Mitra from Sonse village in Chatara district, says he has sent at least 70 village residents to Ranchi for training. He earned around ₹5 lakh in 2015 from selling seeds that he started rearing in 2014 after seeing a huge demand. Bando has now completely shifted to fish rearing in his four-hectare land that was earlier used for paddy.

While the Matsya Mitra scheme is for individuals, the state government has also started initiatives to involve communities in aquaculture. Officials say the initiative is aimed at community water bodies that are largely neglected because there is no sense of ownership. Under this, the government encourages residents to form cooperatives and do collective fishing. The government provides these cooperatives technical guidance and support in terms of vehicles to transport fish to the local market. According to state government data, 393 cooperative societies are engaged in fishing. One of the recent examples of this is the abandoned Bundu dam in Ranchi district. The 4.5-ha reservoir, which was completely covered with grass till November 2015, is today being used to commercially grow fish.



Jharkhand launched the *Matsya Mitra* initiative in 2007. Fish production in the state doubled by 2015. Rajiv Kumar, director, Jharkhand fisheries department, feels that involvement of local communities is a major reason for the success of the initiative



PHOTOGRAPH: KUNJAN PANDEY / CSE

People raise fish in cages in the Chandil dam reservoir in Jharkhand's Seraikela district

Encouraged by the success, Jharkhand government started the cage culture initiative in 2013 that involved communities around dams in aquaculture. The initiative has been implemented to take up water bodies that are traditionally not used for aquaculture. Under the initiative, small portions of a dam reservoir are allotted to individuals, such as Paswan, who grow fish in the cages submerged in the reservoirs. The cages are covered on all sides with nets that do not decompose in water. The state has over 3,000 cages in different reservoirs.

"Normally, an individual is given four small cages, together called a battery. The reason big water bodies such as reservoirs are not used for aquaculture is because one cannot restrict the movement of the fish. This method addresses the problem because the fish are trapped inside the cage," says Dhanraj R Kapse, a fisheries department official in Seraikela district, where the initiative has been successful. He adds that the fish inside the cage are also protected from predators. Kapse says the initiative has not only increased fish production, but also helped in rehabilitation of the communities that were displaced by the construction of the dam in the 1970s. "Residents of the villages that were displaced by the Chandil dam have been demanding for compensation for a long time. In fact, some of the community members also joined ultra-left insurgents. Today, 116 villages around the dam are benefitting from the initiative," says he. Kapse sums it up by saying that Jharkhand's fishery story is a classic example of how government planning and people's support can benefit a state. ■

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Food

You are what you eat. We've all heard it. But in our fast-paced life one needs an overwhelming amount of willpower to cut down on junk food and carefully prepare a salubrious meal. Let us connect you to those who are making such foods accessible to all.

High on nectar

M SUCHITRA



WHAT

Promotion of the coconut sap beverage

WHO

Coconut Development Board

WHY

Health benefits of *neera* has been forgotten after the government classified it as country liquor

It's like doing the unimaginable for Vidya P T, a resident of Kuruvattoor village in Kozhikode district of Kerala. She tightly clasps onto the trunk of the coconut tree and starts climbing it. Two knives and a piece of bone remain tightly fixed to her waistbelt; a small, sterilised pot hangs from it. On reaching the crown, Vidya tends to a spadix, a young inflorescence of coconut palm. She removes the bright sheath around it, gently taps the flowers for a while using the bone, cuts the tip of the spadix and ties the pot next to it. In 12 to 15 days the flowers will start oozing sweet clear sap into the pot. Then, for the next few months, Vidya would climb up and down the tree every morning and evening to collect the fresh sap or *neera*.

Vidya is one of the 20 youths being trained as *neera* technicians by the federation of coconut producers' societies at Payimbra village in Kozhikode. Over a hundred federations in Kerala are providing similar training to cater to the growing demand for the delicious health drink, both in India and outside. "Traditionally, we used to extract a lot of *neera*. It was even given to pregnant women and children as health drink," recalls P Aravindan, president of the Payimbra federation. But the practice was forgotten after the government classified *neera* as country liquor and placed it under the Kerala Abkari Act, 1967, that regulates trade in liquor.

Neera is now regaining its glory. Awareness of the health benefits of the coconut inflorescence sap is growing worldwide. In India, the Coconut Development Board (CDB), a Central government agency, has started promoting it as a health drink. *Neera* is more nutritious than any other commercially marketed fruit juice in the country, says T K Jose, chairperson of CDB. Jose, who serves *neera* as a

welcome drink to all those who visit his office, claims that sugar, jaggery and syrup made out of *neera* are also highly nutritious.

As per articles published in the *Indian Coconut Journal* of CDB, *neera* is a rich source of minerals and vitamins. It has substantial amounts of iron, phosphorus and ascorbic acid. Palm sugar, which is made by boiling *neera*, contains protein, 16 amino acids, vitamin B, iron, potassium, magnesium, calcium and zinc. It can be useful for treating anxiety, depression and bipolar disorder. The most significant characteristic of *neera* and its products is low Glycemic Index (GI), an indicator of the extent of sugar absorbed into the blood. While table sugar has a GI of 70, sugar made from *neera* has a GI of 35. Foods with GI less than 55 are classified as low GI foods and can be used by people suffering from diabetes and high cholesterol.

No doubt *neera* has a great market potential. Of the 19 coconut farmer-producer companies in Kerala, Palakkad Coconut Producer Company (CPC) and Kaipuzha Coconut Producer Company have launched their *neera* brands. "Our objective is to replace unhealthy aerated drinks with fresh and healthy *neera*," says Joji M Thakkadi, chief executive officer, Palakkad CPC. It also sells palm sugar. In 2015, the Kaipuzha CPC had a daily turnover of ₹10,000. It has set up a plant that can process 10,000 litres of *neera* a day.

Coconut farmers are happy about the revival of *neera* at a time when they are facing price fluctuations and monopoly by copra-coconut oil traders. A coconut tree can yield 2-4.5 litres of *neera* a day. "Even if a palm yields two litres, we get a minimum assured income of ₹50 per tree a day for six months. If we leave the palm for nut production, we would get as much," says C Chandran, a farmer in



Vidya P T of Kuruvattoor village in Kerala receives training in neera extraction

Traditionally, coconut sap, or *neera*, was given to pregnant women and children as health drink. The practice stopped after the government classified the non-alcoholic juice as country liquor and placed it under the Kerala Abkari Act of 1967 that regulates trade in liquor



PHOTOGRAPH: AIEEB KOMACHI

Kuruvattoor panchayat who has leased out 50 coconut trees for *neera* extraction.

Neera is also generating employment for the youth. A *neera* technician receives a monthly salary of ₹10,000. This is over and above the incentive they receive for extracting each litre of *neera* and the insurance coverage for any accident, says Anitha Babu, a *neera* technician in Kozhikode. "If 10 per cent of the 180 million coconut trees in the state are available for tapping *neera*, it can generate one million employment and contribute ₹54,000 crore to the gross state domestic production," says Jose. What prevents the promotion of *neera* is its wrong inclusion in the Abkari Act, which defines the non-alcoholic, unfermented juice as country liquor. Jose points out that the Abkari Act came at a time when no technology was available to preserve fresh *neera*. Now technologies have been developed for arresting its fermentation.

In 1939, Mahatma Gandhi wrote that making *neera* sugar a cottage industry is a way to solve the world's poverty. Indonesia and the Philippines market palm sugar with Mahatma Gandhi as their brand ambassador, with his words inscribed on the packets. It's time India woke up to its potential. ■

Jack it up

M SUCHITRA, SHREESHAN VENKATESH AND ALOK BANG



WHAT


Promotion of jackfruit

WHO

Various institutions, non-profits in coastal states

WHY

It is a drought-resistant, climate-resistant & underutilised food crop



James Mathew, a farmer in Kerala's Palakkad district, has developed a number of jackfruit products from wine to baby food

Seventy-year-old James Mathew has an unusual obsession: making processed jackfruit products. His affair with the fruit started in 1998. He would dry, fry, boil and steam raw and ripe jackfruit in a small room all day in Kanjirappuzha village of Kerala's Palakkad district. "He even sold our coffee estate in Karnataka and spent more than ₹10 lakh to fund his experiments," says his wife Leelamma. Over the years James has succeeded in developing a basketful of products. These include a golden-yellow jackfruit wine, dehydrated flakes that can be stored, a health drink, baby food and seed powder.

But he did not try to find a market for his products or earn money from them; instead, he conducted free workshops every year to train people how to make the products. After the training, he would gift them his products. Everybody, including his family, thought he was crazy. "He even got a nickname Chakka James," says Leelamma. "Chakka" is the Malayalam word which got corrupted into "jack" and gave the fruit its name. "I don't care what they call me," says Mathew. "I'm worried about the wastage of a wonderful fruit."

They live in their homestead of 4.8 hectares (ha) that has 60 jackfruit trees of firm-fleshed varikka variety. Every year, between March and July, each tree bears 50-100 fruits. The fruit is so huge that a small family cannot finish even half of it in a day. Once plucked, a mature fruit ripens in two days and perishes in four. So, more than half of the fruits just rot. This is true for wastage across India. On a conservative estimate, the country could be losing jackfruit worth ₹2,000 crore every year, says K Narayana Gowda, former vice-chancellor of Bengaluru's University of Agricultural Sciences.

Earlier, raw jackfruit meal was a staple in Kerala's villages when people ran out of rice and vegetables during the rainy season. "It never fails, even when all other crops fail," says Mathew. It can, therefore, be an important food crop. Small wonder, its cultivation has been spreading slowly in the Vidarbha region of Maharashtra. The jackfruit tree is also easy to grow, requires minimal labour for planting and is resistant to climate change. At a time when environment protection agencies across the globe are emphasising on the need to

focus on underutilised crops and crops that are resistant to climate change, India—one of the largest producers of jackfruit—should have seized the opportunity. Jackfruit is also a good source of vitamin A and C, potassium, phosphorus and calcium and iron.

The only place in the country where large-scale commercial cultivation of jackfruit is being done is Panruti in Tamil Nadu's Cuddalore district. Here, about 4,000 farmers grow jackfruit as a monocrop in plantations of up to 20 ha. The total area under jackfruit in Panruti is 1,000 ha. Farmers here follow a simple agronomic practice, called thinning, for producing bigger and better fruits. This helps them earn more money. Excessive fruits are removed from the peduncle at a tender stage, allowing only the selected ones to grow.

"Here, you won't find fruits that weigh less than 15 kg," says Perumal Haridoss, deputy director of agriculture, Cuddalore. Farmers get a steady annual income of ₹1,50,000 per hectare. Even when they sell the crop to brokers, they earn good money. The fruit is available round the year.

Even those who grow jackfruit as a scattered tree in small landholdings can make money, provided there is direct market linkage, as was seen in Toobugere, a block in Bengaluru. Farmers in Toobugere would earlier sell jackfruit to brokers at a throwaway price of ₹25-30 per piece. But this changed after Toobugere Jackfruit Growers Association was formed in 2009. Now, an average fruit weighing 15-20 kg gets them ₹70-100. The association, which is the only body of its kind in the country, was formed as part of a project undertaken by Bengaluru's University of Agricultural Sciences. The project covers 8,340 families in 75 villages in the block. The university has linked the association to Horticulture Producers Cooperative and Marketing Society, a big vegetable and fruit outlet. The association pools in thousands of jackfruits and brings them to the marketing society. "I earn ₹2,500-3,000 per tree," says M G Ravikumar, secretary of the association, who has 35 trees.

However, most jackfruit growers in the country are not aware of its economic potential. Sunny George, chairperson of Tejaswini, a coconut farmers' producer company in Kerala's

At a time when environment protection agencies across the globe are emphasising on the need to focus on underutilised and climate-resistant crops, India, one of the largest producers of jackfruit, lets half of its produce go waste

Kannur district, has 1,000 jackfruit trees in his 1.5 ha pepper plantation as support trees to the vines. He says, "We realised the commercial value of the fruit only when a jackfruit processing unit was set up in Kannur." Earlier, he would remove all the leaves on the trees to avoid fruiting and would use the trees only for supporting the vines. The processing unit, Artocarpus Foods Pvt Ltd, set up in 2015, is the country's first full-fledged processing unit exclusively dealing with jackfruit. Members of Tejaswini have started supplying jackfruit to Artocarpus at ₹5 per kg.

Subhash Koroth, managing director of Artocarpus, says if he could utilise the fruits that get wasted in his district, he would be able to feed the entire state. "I process 200-300 fruits a day. But I'm not using even half per cent of the fruits getting wasted in my district," he says.

Local consumption and demand for jackfruit remain low mainly for two reasons: the huge size of the fruit and the cumbersome process of peeling its thick, spiky latex-filled rind and scooping out the bulbs. A simple innovation here can make a difference, as Jhunu Malik in Kanteikoli tribal village of Odisha's Gajapati district found out. She received a slightly tweaked wood-plainer used by carpenters and training in minimal processing by the regional centre of the Indian Institute of Horticultural Research in Bhubaneswar. "This small machine has changed my life. Earlier, it used to take 10-15 minutes to peel a jackfruit. But with this machine it is quick. Since I started using this, I am earning six times more," she says.

"The machine weighs 1.75 kg. We reduced the weight to 1.5 kg by removing some parts," says H S Singh, head of the centre. "We're trying to further reduce the weight." By using the wood-plainer, tribal women in Odisha are enhancing their skills while increasing their income. "Now that peeling jackfruit is much faster, we cut it into cubes,



Processing of the jackfruit pulp at a unit owned by non-profit People Service Society Palakkad in Kerala

Processing jackfruit in ready-to-cook, ready-to-eat and ready-to-serve forms is the only way to increase its demand. The farm science centre under the Indian Council of Agricultural Research has developed 40-odd value-added jackfruit products and trains people in making those



Making of jackfruit pulp at a unit owned by Kerala-based non-profit People Service Society Palakkad.

smear a solution to prevent browning, pack it and sell it as a vegetable for ₹30-40 per kg in the local markets," says Padma Mallik, Jhunu's friend. Both of them are office bearers of a self-help group of 10 women. There are five such groups in Mohana block Gajapati district. Each group has one machine, which costs ₹2,200-2,500.

Processing jackfruit in ready-to-cook, ready-to eat and ready-to-serve forms is the only way to increase its demand, says K C Misra of eKutir Social Business, a non-profit in Odisha that trains women on minimal processing and packing of jackfruit.

People Service Society Palakkad, a Kerala-based

non-profit, started making a variety of ready-to-eat products in 2013 at the behest of James Mathew, using technologies he had developed. In 2015, the non-profit did a business of more than ₹1 crore. The society has four units that make products such as pulp, *chakkavaratti* (a traditional preparation in ghee), pickle, jack seed chutney powder, flour, honey jackfruit, candy, cake and cutlet. It procures jackfruit from farmers living within 20 km. With decentralised production, procurement of raw material becomes easier and transport costs are lower, says Shaji Elanjimattam, chief coordinator of the project. They employ people working on daily wages for peeling and cutting the fruit, generating livelihood opportunities.

In 2013-14, the Palakkad society sold eight tonnes of value-added products from 200 tonnes of jackfruits bought from farmers. "We paid ₹8 lakh for 200 tonnes of jackfruit to farmers," says Shaji. In 2014-15, it bought 800 tonnes of jackfruit from farmers.

James Joseph, a former director at Microsoft who started an innovative business venture called Jackfruit 365, says he buys neatly cut pieces from the society, transports them in his own vehicle with cold storage facility, dehydrates them using freeze-dry technology and sells them in handsome packets. He also exports the product to United Arab Emirates. "There is a huge demand for jackfruit products," says Christine P Robbert, chief programme coordinator at Krishi Vigyan Kendra, Pathanamthitta, Kerala. The farm science centre, which comes under the Indian Council of Agricultural Research, has developed about 40 products and has been training people in making value-added jackfruit items. The area has 1,200 ha under jackfruit but about 16 million jackfruits get wasted every season.

Certainly, there is room for innovation. ■■■