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# Agriculture & Industry Survey

India's Leading Business Magazine for Agriculture

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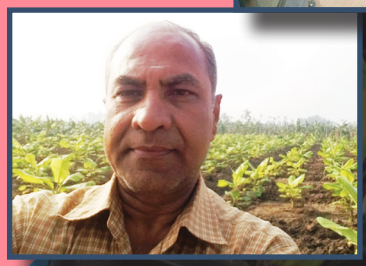
Ganapathy Ajeethan



**GANAPATHY AJEETHAN**
Says the change in mindset of farmers will help earn millions in Banana cultivation by adapting modern technologies and cost effective value addition of banana using solar energy.

**BALAMURUGESAN RM**
Talks about his success story of shifting from IT to organic farming to direct consumers.

**DR. PRASHANT SHARMA**
Discusses about Milk and milk products processing.

**ASHISH GUPTA**
Explains the various methods of natural oil extraction.

**K. KARTHIK**
Talks about how to use quality agri inputs for healthy soil and healthy plants.

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# GREEN REVOLUTION 2.0

## Wonder rice?

### *Yes, it looks like that! This new discovery is likely to reduce emissions and offer a good yield!*

Much to cheer in the Agri sector! Yes, problems in agriculture are too familiar and too complex. It is not the claim of any politicians to say they have the solutions to this vast spread of poor people with less than one acre per capita to emerge tomorrow to come out and come to save the world and save India.

Let us at the same time not forget some of the ground realities. With all the challenges India today remains the world's largest rice exporter. And the time has come when we have to change our mindset and let us not always deplore and feel dejected. The time is right now and here to realize that India is a big democracy and friend of the world's lesser endowed countries in terms of the production of foods. That we can feed and reach out to the needy and the hungry.

And India has a role to play in the world production of food and food export can play a highly beneficial diplomatic role in winning friends and influencing people all across the world.

Is there any space in the Agri sector to be cheerful about? With the farm laws dragging the farmers in Punjab and Haryana for so long and with the attention of the government and the tired-out Prime Ministers many challenging issues of the day take much of the public attention. It is not an everyday issue with the farmers or others equally. Engaging problems taking much of the government's time who cares for much bigger or broader issues like those of farmers who are so dispersed across the vast spread of the country, along with the much more pressing international events like climate change and much of foreign travel which is much more important than any other domestic issues.

Climate change and the natural environment with untimely rain and floods inviting the attention of the government machinery, agriculture, let us grant much of a less priority.

In this rather dismal day, today's scenario comes some cheerful news. The Manila-based International Rice Research Institute has come out with much awaited breakthrough in releasing a new variety of rice that they report has nine characteristics, besides high yield, upto around 4 - 5.5 tonnes per hectare. If the same variety is grown through puddling the yield level goes even further to almost seven tonnes per hectare, researchers claim.

The cross country trials are being conducted right now across 29 sites in Asia and Africa including India.

What are the nine major traits identified by the researchers?

They are: Faster emergence of seeds, Emergence from deeper soil, Anaerobic germination, Early rigor and fast canopy closure, Drought tolerance at seedling stage, Drought resistance at reproductive stage, Nematode resistance, Lodging resistance at the root & Medium plant height

No more and detailed coverage of this rice discovery has caught the interest of our mainstream media. We need more information and a more critical review of this latest development in our Green Revolution Country.

Let us welcome the positive development. We are basically rice growing nation. We have achieved many breakthroughs. Let us congratulate our own agri scientists and others in the agri departments and related areas.

Let the 100-days daily rural employment scene get integrated with the mainline agricultural activities like raising mainline crops.

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# How agriculture now occupies the world media headlines?

**Fresh thoughts on the critical sector! In the latest world hunger index, India is shown in a poor light after many small neighboring countries!**
**This is an insult to our media organizations.**

We have to change our media priorities from what we generally think our own political scenarios. Let us at least now change to serious priorities. Agriculture is a field where the majority of our people, mostly poor and exposed to many risks in their day to day livelihood issues. India is a particularly vulnerable country and economy that is still basically a backward society. That resists change in ways other than what is known so far. Even after nearly a near-century of freedom and much government efforts in planning and development we still remain a rural economy, where people in the villages remain subject to so many superstitions and lack of modern facilities like adequate education and healthcare.

The nearly one and a half years of the pandemic only proved how our health infrastructure has been inadequate to respond in a desired manner. Thank god that we have been at least able to produce our own Indian-made vaccine and also emerge as the independent manufacturer and also invent our own new indigenous new one, India made brand and our whole experience in managing the unprecedented crisis gives an enormous self-confidence.

Other things apart that the Prime Minister deserves all the praise and credit for pulling the country out of this great challenge. Of course, the economy is to a great hit, and we are in the process of completing the story of our economic management and we are far from getting on the growth track and the problems are too many and too many big and small complications, remain to be solved.

Now the most critical sector that needs for the nation is agriculture and agriculture is not an easy sector where so many issues are there first a sense of clarity and a sense of truthful talk. Unfortunately, agriculture is an alien field for those living outside the villages. Not only that but agriculture is also left out of any concern for the vast mass of urban society.

See how the political discourse in the cozy circle of top political party circles. Those who are in the policy-making circles, leave out the rural and agriculture sectors in prescribing policies. They invent some catchy phrases, like 100-days work for those who are without jobs. The 100 days rural employment has as you can see outlived its initial attraction and what remains is the high profile gentlemen and ladies who sat near Sonia Gandhi in the National Advisory Council have all lost their initial glamour and we don't know today whether the NAC is still in existence or not.

All the agriculture policies today are tested by the PM's many other policy initiatives for agriculture except for the critical insight the PM himself had left the organized farmers groups to their own devices and they are all hanging around the Delhi outskirts and, in fact, Indian agriculture development strategies, have no basic focus and Indian agriculture is languishing in a vacuum and there are no ground realities in the current thinking on Indian agriculture. On themes realistic sense the Indiana Indian farmer, the peasant, and the landless labor have taken on many new avatars, as internal labor migrants, there is a flow of rural coolies from the Northern and North Eastern states o the Southern states. There are no landless labor enclaves in many of the Sothern states. In Kerala, Tamil, and Telangana, why even in a great many cities, in Mumbai there are many variations, Mumbai taxi drivers reform UP and so on.

This new dimension of the Indian landless coolies has to be welcomed in the wake of a great many industrial cities and it is one of survival instead of any new policies. At the micro-levels we often say, we say things to sensitize our 500 and odd economic policy advisers to the Central government, most of them sitting pretty at the cozy climate of Delhi's Lytton's bungalow zone. Far distantly in the rural inhabitations sirs the helpless average Indian landless farmers who must from now onwards be called only as a debtor or litigant in the complex web of Indian bureaucracy and a new bureaucracy of retired bureaucrats who get themselves posted in another cozy enclave the PMO!

Yes, there is any number of. Retired bureaucrats who also get posed as Cabinet ministers and what other cushy jobs are available aplenty in Delhi city itself!

With less than one hectare per head, Indian farming is cursed by the lack of any new reforms. All over the developed world agriculture is in crisis, more so in the post-Brexit European countries where small farmers are suffering from the new confusion prevailing in farm policymaking. There is a shortage of labor, more so agri labor for seasonal work fruit picking, and vegetable farming and so the world of small farmers are in deep crisis. So, there is a need for wider social understanding and. Appreciation of farming in the new world of many other wide crises of climate change and environmental issues.

Public intellectuals and experts must come forward and suggest new positive policies to see the environment and the crisis at the micro-level of people living in small communities. Yes, at the macro level, in big agricultural economies like the USA, China, Russia, and India, these large countries have managed to produce basic grains and other food needs like cooking oil and pulses there are imports and exports and today food production for exports has become a high-level diplomatic tool these countries practice their foreign relations.

So, agriculture has come centre stage in modern-day world where there are pockets of political turmoil with food shortages and also the presence of large scale hunger etc.

These issues make agriculture and food production and distribution, a high profile international and a world high priority.

## This 23-year-old Andhra farmpreneur sows seeds of soil-less farming

Meet 23-year-old Sandeep Kannan, a young farmpreneur from Tirupati, who is striving to deliver nutritious, clean and pesticide-free leafy vegetables to the residents of Tirupati. Unlike his peers, who are now preparing for competitive exams, Sandeep, after completing his BSc Agriculture from Tamil Nadu Agriculture University (TNAU) has set up an 'urban farm' called 'Vyavasayi Bhoomi' and started farming in his half-an-acre agriculture land at Thanapalle. He is cultivating vegetables through Polyhouse Hydroponic farming.

Lettuce, spinach, red amaranath, kale basil, broccoli, pak choi (Chinese cabbage) are some of the leafy vegetables being cultivated by Sandeep at his farmland. Speaking to TNIE, Sandeep said the vegetables grown using Polyhouse Hydroponic farming are rich in nutrients and fibre when compared to the products cultivated through organic farming.

"This kind of farming involves less cost and the plants are grown in a temperature-controlled system that provides enough nutrient supplements for their growth," he said. Sandeep said, "Unlike traditional farming practices, Hydroponic farming involves soil-less cultivation thus allowing the farmers to get a better yield on their investments. After sowing seedlings in net cups, the plants are allowed to grow in a man-made environment for 45 to 60 days and then the plants are ready for harvest."

Read full @ https://bit.ly/3k0ugur

Source : www.newindianexpress.com

## Indian scientists discover a new disease in millet crop, earn global recognition

*Incessant complaints by millet farmers in Haryana about their crops getting infected by a black rot motivated the agriculture scientists to look deeper into the issue. The cause of infection was found to be a bacterium that is generally found in humans. The discovery by scientists in Hisar has earned them global recognition. Details here.*

In 2019, farmers in Haryana's Hisar, Bhiwani and Rewari districts witnessed strange black stripes on the leaves of their millet crops. Such markings were never seen before by the farmers. Within days, the stripes took over the entire plant and turned it dry and brittle. The cultivators perceived it to be an unprecedented disease and informed their local krishi vigyan kendras (farm science centre) about the black rot in their millet crops. Then, the following year, in 2020 when the COVID19 pandemic began, identical symptoms in the millet crops were reported again.


"For two years, we gathered information about the unprecedented symptoms observed in millet plants," Vinod Malik, Assistant Professor at the Plant Pathology Department of the Hisar-based Chaudhary Charan Singh Haryana Agricultural University told Gaon Connection

"After intense screening for morphological, pathogenic, biochemical and various other tests, it was revealed that the black rot is due to the bacteria which is found in human intestines,"the agriculture scientist added. Malik further informed that the bacterium behind the infection is called Klebsiella aerogenes and speculated that it must have been transferred to millet crops via faecal matter. The disease in millet crops has been named as 'stem rot'. Interestingly, the bacterium which has infected the millet crops in Haryana is naturally found in the human intestines and usually doesn't cause any disease in healthy persons.

### 'Never reported before across the world'

Led by the assistant professor, a team of scientists from the Hisar-based agricultural institute reported their findings to the United States' National Center for Biotechnology Information (NCBI) which replied that such findings have not been reported before. "We then approached the American Phytopathological Society (APS) which is an international authority on plant diseases and new diseases are registered by it. We then got a confirmation that what we had found was actually a discovery. The APS not only recognised the disease but also published our report in its reputed journal," Malik told Gaon Connection.

### 'Treatment research underway'

Meanwhile, BR Kamboj, the vice-chancellor of the Hisar-based institute told Gaon Connection that there is no cure for the disease as of now and further research is ongoing. "The Corona pandemic has underlined the importance of identifying new diseases as soon as possible. I am glad that researchers from our institute have made a discovery and I appeal to them to work towards finding its cure," Kamboj said.

The scientists, motivated by their discovery, are hopeful that they will soon find the cure of the disease in millet crops. The states of Rajasthan, Maharashtra, Haryana, Uttar Pradesh and Gujarat are the leading producers of millet in India.

Source : en.gaonconnection.com

# Ryot first, Neta second: Niranjan Reddy transforms his land into instructional farm

*That farmer, who did not bow down to the traders who tried to fleece him and took pride in being a ryot, is none other than Agriculture Minister Singireddy Niranjan Reddy.*

A farmer was taken by surprise, a few years ago, when a fruit trader approached him and offered Rs 6 per kg for his pumpkins. Not happy with this price, he transported the entire produce to the Kothapet fruit market for sale, where the price came down to Rs 5 per kg. Offended and angered over this, the ryot decided to give away all the pumpkins he raised to the people of Wanaparthy for free.

That farmer, who did not bow down to the traders who tried to fleece him and took pride in being a ryot, is none other than Agriculture Minister Singireddy Niranjan Reddy. Leading by example, Niranjan Reddy has been an inspiration to many by the virtue of his passion for agriculture in general and more specifically for organic farming. With determination, Niranjan has transformed his 50 acres at Kethepalle village in Pangal mandal into an instructional farm for experimentation and learning. His farm boasts 12-14 varieties of mangoes in 30 acres with each tree having a unique identification number which helps in monitoring, tracking and treating the trees' growth with precision and perfection.

Apart from mangoes, the Minister also grows Manikchaman grape, custard apple, papaya, guava, dragon fruit, water apple, lychee, jamun and other fruit varieties, in addition to brinjal, tomatoes, chillies, cabbage, capsicum, bitter gourd, okra and other leafy vegetables.

Intercropping of leafy vegetables, marigold and chrysanthemum flowering plants between the mango trees and growing sandalwood and areca nut trees on the bunds have been done to optimise the use of space.

The workers who live at the farm consume the veggies and the flowers grown are used for decoration works. S Vasanthi, his better half, plays an equally important role by managing the field and workers. She not only gathers various plants, but also plans where they should be planted in the farm.

Niranjan has also been raising over a hundred cows, six bulls, 40 sheep, backyard poultry and a ducks to promote integrated farming.He has been certified by Eurocet for Good Agricultural Practices and by Telangana State Seeds Organic Certification Authority for organic farming.

Before the pandemic, he showed the way by exporting mangoes to Europe and during the pandemic last year, his mangoes, which were branded 'SNR Mangoes', were shipped to Bengaluru to be delivered at residential communities predominantly inhabited by IT employees. Techies living in 40 such communities in Bengaluru organised themselves and made one person in-charge from each community to prepare indent and procure fruits and vegetables directly from the farmers.

Last summer, Niranjan used this network called 'Namma Farmer' which conceptualised farm-to-home method to market and deliver his mangoes to those who had placed orders. This has reportedly been a win-win situation for farmers like him and techie consumers.

12-14: Varieties of mangoes are being grown in 30 acres with each tree having a unique id number

Fruits aplenty: Apart from mangoes, the Agriculture Minister also grows Manikchaman grape, custard apple, papaya, guava, dragon fruit, water apple, lychee, jamun and other fruit varieties

Source : www.newindianexpress.com

# This Kerala woman followed her heart, to reap success

**Paddy being boiled in large copper vessels called 'chembu', its aroma filling the corridors of houses, and then being dried on bamboo mats have become rare sights. Especially with fields shrinking, and even farmers selling paddy to Supplyco and purchasing rice from outside for household consumption.**

**But take a trip to the village of Kambrath Challa on the Kerala–Tamil Nadu border in Palakkad, and the nostalgia comes alive. No plastic mat is used to dry paddy there and husk is removed using a rubber roller preventing heat from entering directly into the rice, which helps preserve nutrients.**

**"The milling process to polish rice takes away these minerals," says Biji Aboobacker, who has set up a unit in Kambrath Challa to process and pack rice. Now 45, she has had hands-on experience in farming since 2008. She and her husband, Hilal, were advocates of natural farming. They even undertook farming for celebrities like Mammootty and Sreenivasan.**

**However, Biji lost everything in the 2018 flood. Burdened with debt, she left for Dubai along with her four children in search of a job. The devastating flood, which swallowed 270 acres of crop cultivated on leased land, also sowed seeds of discontent within the family, resulting in their separation. After a brief stint as a quality supervisor in Dubai where her sister, Serina, is based, the passion for farming has brought Biji back to Kerala. And she has pitched tent in Palakkad.**

**Read full @ https://bit.ly/2ZL9tnY**

**Source : www.newindianexpress.com**

# India's record rice crop brings problem of plenty for farmers juggling protest

Farmers in India are gathering in the largest rice crop in history, which promises record exports, while making sure to keep up their longest-running protest, set to turn a year old next month.

The sit-in against controversial agriculture reforms is taking place in the capital, miles away from the five acres (2 hectares) of lush green rice paddies tended by Sukrampal Beniwal in his village of Munak, in the northern state of Haryana.

"We'll not budge until the government rolls back the laws," he said, referring to three measures the farmers, demonstrating by the tens of thousands in New Delhi, say will threaten their livelihoods.

Farmers in the breadbasket state have joined hands to bring in the mammoth crop and make sure that every time a group sets off to harvest rice, a similar number leave to join the protest on the outskirts of New Delhi, Beniwal said.

"Because of our camaraderie, we have quite successfully dealt with the two competing challenges: managing the protest against legislation and harvesting a big crop," he added.

Introduced in September last year, the legislation deregulates the agriculture sector, letting farmers sell produce to buyers beyond government-regulated wholesale markets, where growers are assured of a minimum price.

While small farmers say the changes make them vulnerable to competition from big business, and threaten the eventual loss of price support, the government says the reforms will bring them new prospects and better prices.

Yet, with global food prices near decade highs after a surge of 30% in rates for cereals over the past year, India's problem of plenty also offers a dazzling opportunity. The new harvest will boost exports to help the South Asian nation cement its status as the dominant supplier of the world's most critical grain, traders say.

"Indian prices are very attractive at a time when demand is rather strong from many buyers, including China and a clutch of countries in Africa," said Aditya Garg, a leading exporter of the grain. "In fact, for non-basmati rice, many Indian exporters have received orders from a lot of new buyers in Egypt, Sudan, Tanzania and Iran."

Coming at a time of flat output in traditional export powerhouses Vietnam and Thailand, the higher supply will let New Delhi offer more competitive rates to undercut any rivals.

Output of summer-sown rice in 2021/22 will hit a record 107.04 million tonnes, the farm ministry says, while combined output of summer and winter rice will hit 125 million, or about 24.5% of global rice output, its largest ever.

Coupled with upgraded export facilities, that volume will allow India to repeat, or even surpass, last year's record export tally of 20 million tonnes, filling growing demand for the staple from buyers across Asia, Africa, and the Middle East.

India is selling 25% broken rice, a non-basmati variety preferred by most overseas buyers, at $345 a tonne on a free-on-board basis compared to $360 offered by Thailand, the world's second biggest rice exporter, dealers said, with some cargoes even sold at $320 a tonne.

## CHANGE UP

Farming sustains almost half of India's population of nearly 1.4 billion and makes up about 15% of a $2.7-trillion economy. Rice is India's biggest foreign exchange earning farm commodity, with shipments worth $8.82 billion in the fiscal year that ended in March 2021, government figures show.

Until two seasons ago, India's annual rice exports averaged about 11 million to 12 million tonnes. But shipments soared to 20 million tonnes for a record share of 40.7% of global trade last season, data from the U.S. Department of Agriculture (USDA) shows, after growing problems in Southeast Asia pushed up the prices of rivals to make Indian non-basmati shipments attractive to hungry global buyers.

"As climatic conditions helped our farmers raise the country's rice production, we've permanently become an even bigger player in the international market, and our share will grow," said trader Rajesh Paharia Jain at Unicorp Pvt Ltd. In Munak, 130 km (80 miles) from New Delhi, the rice farmers showed no sign of relenting.

"Our record crop shows we are making India more than self-reliant in food, and the government shouldn't insist on laws that will spell doom for agriculture," said rice grower Ravindra Kajal.

Source : economictimes.indiatimes.com/

# Online Meetings @ www.agricultureinformation.com

## Upcoming events

**NOVEMBER 12, 2021**
**3:00 pm**
Mr. Rajender Kumar on Potential greenhouse crops for Indian market"

**05.00 PM**
Mr. Tanmoy Mondal on "Pre-harvest fruit bagging - Useful approach for quality fruit production"

**NOVEMBER 15, 2021**
**3.00 PM**
Dr. Chirasree Gangopadhyay on "The integrated rice insect pest management for the farmers across India"

**05.00 PM**
Dr. Anandkumar Naorem on "Why farmers should test their soil?"

**NOVEMBER 16, 2021**
**3:00 pm**
Mr. M Govindaraj on "Crop Biofortification: Translating green revolution to nutrition revolution"

**05.00 PM**
Dr. Ambika H D on "The role of algae in agriculture"

**NOVEMBER 17, 2021**
**3:00 pm**
Dr. Digvijay Singh Rathore on "Commercial cultivation of black turmeric ( curcuma caesia) with fig intercrop"

**05.00 PM**
Mr. Lokesh Singh Chouhan on" Papaya and ashwagandha intercrop farming"

**NOVEMBER 18, 2021**
**3:00 pm**
Mr. Sreekanth S on "My experience with aloe vera farming"

**05.00 PM**
Mr. Balram K S on "Tissue culture bamboo cultivation – Our company's experience"

**NOVEMBER 19, 2021**
**5:00 pm**
Mr. Varghese Thomas Panicker on "My experience with ornamental fish aquaculture"

**NOVEMBER 22, 2021**
**3:00 pm**
Mr. Abhishek Patel on "How can you use rainwater harvesting on your farm?"

**NOVEMBER 23, 2021**
**3:00 pm**
Mr. Biswajit Ghosal on India's ongoing blue revolution – Fish farming

**NOVEMBER 24, 2021**
**3:00 pm**
Mr. Aum Sarma on "Some of the latest farm machinery available in India"

**NOVEMBER 25, 2021**
**3.00 PM**
Dr. S.K. Bakshi on "Herbal development – Discussion about a new crop"

**NOVEMBER 26, 2021**
**3.00 PM**
Ms. Jeevitha on "Herbal Soap manufacturing and marketing"

**05.00 PM**
Mr. Nilemesh Das on "Diagnostic approaches in aquaculture practices"

**NOVEMBER 29, 2021**
**3.00 PM**
Mr. Balavantbhai Patel on "Red seedless guava: Cultivation, economics & marketing"

**5.00 PM**
Dr. Anand Prakash on "Influence of pre cooling & cold chain logistics for post-harvest shelf life extension of perishables"

**NOVEMBER 30, 2021**
**05.00 PM**
Mr. Vivek Kumar Patel on "Potato cultivation, economics and marketing techniques for farmers"

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## Recently Completed Meetings

**Mr. Vimal Panjwani on "Rural household savings improves using renewable energy"**
Mr. Vimal Panjwani is the Founder & CEO of AgriVijay in Pune, Maharashtra. To know more view https://bit.ly/3i5obwL

**Mr. Kulkarni HB on "Organic Certification - Cultivation problems & solutions"**
Mr. Kulkarni HB is the President of Federation for Re-farming Societies in Bengaluru, Karnataka. To know more view https://bit.ly/3ByAKrA

**Ms. Ruchi Bishnoi on "Introduction to PPV & FR Act, 2001 and Farmer's Right"**
Ms. Ruchi Bishnoi says that Government of India enacted "The Protection of Plant Varieties and Farmers' Rights (PPV &FR) Act, 2001" adopting Sui Generis System. The legislation recognizes the contributions of both commercial plant breeders and farmers in plant breeding activity and also provides to implement.

**Mr. Goutam Roy on "Sustainable aquaculture and fisheries management"**
Mr. Goutam Roy says fish is crucial to a nutritious diet in many parts of the world. It is recognized not only as some of the healthiest foods on the planet but also as some of the least impactful on the natural environment. For these reasons, they are vital for national and regional nutrition strategies and have a big part to play in eliminating hunger and malnutrition.

**Mr. Tejram Nagar on "Soilless cucumber cultivation - economics and marketing"**
Mr. Tejram Nagar is an Agronomist at My Crop in Ujjain, Madhya Pradesh. During this meeting, he will discuss
– How to grow cucumber under protective structures.
– Cucumber growing in soilless systems substrate hydrophobic aeroponic.
– What is Benefits of soilless growing media.
– Nutrients requirements of cucumber production.
– Method of irrigation and fertigation.
– Disease and pest management.

**Mr. Mukesh Ramagoni on "Creating a value through Agripreneurship in rural India"**
Mr. Mukesh Ramagoni is the Business Development Manager at AgHub in Hyderabad, Telagana. Mr. Mukesh Ramagoni says, Agripreneurship or Entreprenuership in agriculture is now vividly explored subject and is been the talk of town in entrepreneurial ecosystem. But is this really creating a value at gross root level or is it becoming successful in the last mile delivery of innovation and technology which can up bring and impact the rural community ?

**Dr. Chandra Kiran Sant on "Process optimization in dairy farming"**
Dr. Chandra Kiran Sant is the Dairy Advisor at Livestock Management Centre in Mumbai, Maharashtra. He is also associated with
1) Gomati Cooperative Milk Producers Union, Tripura as Expert Dairy Development for improving the milk quality & quantity as well as oversee installation of 40000 LPD Dairy Processing Plant.
2) Trainer (for Dairy Farming) in Indian Dairy Association – West Zone: covering Maharashtra, Gujarat, Goa, Madhya Pradesh, Daman and D. Nagar Haveli since 2010.
3) Technical Advisor ( Dairy ) in Paragaon Enterprise Industries in Vadodara,(Gujarat) since 1992 ; a Company engaged in manufacture of cattle feed plants & equipments.....

**Mr. Amarnadh Adusumali on "Dragon fruit farming"**
Mr. Amarnadh Adusumali is the Director of The Solai Project Farm and Nursery in Narikudi, Virudhunagar District , Tamilnadu. His interest is on dragon fruit farming.

**Mr. Thiruvikram CS on " Domestic market for cut flowers"**
Mr. Thiruvikram CS is the Proprietor of Avanthika Flowers in Hosur, Tamilnadu. His interest is on opportunities and challenges in flowers.

**Mr. Jitender Choudhary on "Business opportunities in freshwater pearl culture"**
Mr. Jitender Choudhary is the Proprietor of Biva Pearl Farm in Ghaziabad, Uttar Pradesh. To know more view https://bit.ly/3Bo6rDr

**Mr. Sudhanshu Kumar on "Use of modern technology in banana"**
Mr. Sudhanshu Kumar is the owner of Orchards of Nayanagar in Samastipur, Bihar. He says when we do any agricultural work without the use of technology we always miss out on the real profits. By real profits, he means minimum input maximum profit. The use of technology works like a double edged sword. It decreases input cost and increases productivity. Further more Mr.Sudhanshu Kumar says technology helps us to maintain good quality. Good quality gets us premium prices.

**Dr. K. Prasad on "Postharvest technology of horticultural crops"**
Dr. K. Prasad says, India is one of the highest producers of fruit and vegetable at the global level, but at the same time, it is well evident that postharvest losses of horticultural crops are at an alarming level i.e. up to 30-40 percent. Present need to reduce these losses emphasis the importance of an emerging field of horticulture known as postharvest technology. ,.....

### Mr. Narayanan Alwar on "Farm management from remote"

Mr. Narayanan Alwar says , in modern times, aspiring farmers have to earn their living through multiple options. A stable job or business in city and then a farm at remote and affordable place. Especially during lockdowns or because of long distance, or even family issues it is not possible for them to travel to the farm for its maintenance. Then how to run the farm from remote.? Let us explore the practical nuances of it in this lecture.

### Mr. Chetan Gore on "My experience in selling mangoes by creating brand"

Mr. Chetan Gore is the Managing Director of Urjit Biotech Pvt. Ltd. in Sangli, Maharashtra. He is passionate about farming for long and actually started it in 2005 -06. Mr. Chetan Gore says they only had land ( 8 acer ) at place called Belanki, in Miraj Taluka of Sangli District which is 40 km away from his house....

### Mr. Kishan Makani on "Opportunity and Government incentives for food industry"

Mr. Kishan Makani is the Co-Founder of Alliance Engineering Consultant in Gandhinagar, Gujarat. He says food processing plays a vital role in the addition of value to farm produce and increases shelf life which can increase the farmer's income. To know more view https://bit.ly/3B8dIaD

### Mr. C. Thatchinamoorthy on "Climate change and climate smart agriculture practices"

Mr. C. Thatchinamoorthy says agriculture in developing countries must undergo significant transformation if it is to meet the growing & interconnected challenges of food and nutritional security and climate change. .....

### Dr. Devesh Thakur on "Desired traits needed to become successful agro entrepreneur"

Dr. Devesh Thakur is an Assistant Professor at CSKHPKV Palampur in Himachal Pradesh. To know more view https://bit.ly/3B8LlJg

### Ms. Kritika on "Mushroom cultivation as an commercial enterprise"

Ms. Kritika is a Student of Lovely Professional University in New Delhi. During this meeting, Ms. Kritika will discuss about :

1. The package of the practice of white button and oyster mushroom.
2. The spawn and different spawning methods.
3. Different types of composting. .....

### Dr. R. Chitra on "Cultivation of tamarind trees"

Dr. R. Chitra says tamarind is an important tree spices and also condiments. The tree is mainly grown in waste land and avenue side. Sweet tamarind, red tamarind and sour tamarind are the tamarind types. In the sour tamarind, PKM 1 is a high yielding variety. Apart from pulp, lot value added products also available in tamarind. This session will be very useful to students, farmers and entrepreneurs.

### Mr. Nitin Singhal on "Insecticide resistance management and insect controls"

Mr. Nitin Singhal is the Director of Huntin Organics Pvt.Ltd., Faridabad, Haryana. To know more view https://bit.ly/3Fc91z1

### Mr. Aruneswar MGB on "Climate smart agriculture"

Mr. Aruneswar MGB says he has a vision to make India not only being top producer of various crops but also top in crop productivity that will be possible with adapting climate smart scientific production technologies and market led production & extension.

### Ms. Keerthi Tanneeru on "My experience in setting-up Farmer Producer Organisation(FPO) "

Ms. Keerthi Tanneeru is the Director of Operations at Future AgriNest Farming Solutions Private Limited Company at Suryapet District, Telangana. To know more view https://bit.ly/3F12J4R https://bit.ly/39MTNlo

### Mr. Nitin Kumar Goudar on "Profitable teakwood farming"

Mr. Nitin Kumar Goudar is the Founder & CEO of Darvi Group in Hubali, Karnataka. To know more view https://bit.ly/33xERFd , https://bit.ly/3q1L2uI

### Dr. Rajeshnallaiah on "Farming on terrace"

Dr. Rajeshnallaiah is the Director & CEO at RNR Agri Developers in Madurai, Tamilnadu. He is into providing terrace garden training. To know more view https://bit.ly/3vvPKCc

### Mr. Samiuddin S.Kazi on "Crop nutrition management for fruit pruning in grape"

Mr. Samiuddin S.Kazi is the General Manager & Head Agronomy of Fertis India Pvt. Ltd. in Hyderabad, Telangana. His interests are crop nutrition ,crop management , farm mechanization, horticultural operations.

### Mr. Arvind V on "Amla softwood grafting"

Mr. Arvind V is the Proprietor of AVR Nursery in Salem, Tamilnadu.

### Mr. Ameya Padma & Ms. Jyoti Padma on "Indian breed cow farming & its uplifting (with business model)"

Mr. Ameya Padma & Ms. Jyoti Padma are the Proprietors of Sree Balkrishna Dairy Farm ( BKD MILK ) in Thane, Maharashtra. To know more view https://bit.ly/2VAM9Hg

### Mr. Yogesh Thite on "What are the modern and commercial aspects in dairy farming?"

Mr. Yogesh Thite is the CEO of Meticulous Business Plans in Pune, Maharashtra. To know more view https://bit.ly/3xOKBb1

### Dr. N B Gaddagimath on "Dolichos - A seed that rewards every farmer"

Dr. N B Gaddagimath is the Founder & MD of Sarpan Seeds in Dharwad, Karnataka. To know more view https://bit.ly/3yUlz9x

### Dr. Vidur Sahgal on "The Indian National Water Pipeline Grid (INWPG)"

Dr. Vidur Sahgal is the Proprietor of Original Mechanization & Data Integrated Consultancy (OMDIC) , New Delhi.

Dr. Vidur Sahga says, he propose a water pipeline grid all across India, just like the national electricity grid with areas of excess being diverted to deficit areas of both water & electricity. To know more view https://bit.ly/3ndAauz

**Online meetings are available only for Premium Members**

# Talking To

# Dr. Sivalingam Elayabalan

**Technical Director & Agriculture Scientist**
**Sankar Bio-Tech in Hosur, Tamil Nadu**

M.Sankar
Founder and Director

Dr. Sivalingam Elayabalan is the Technical Director and Agriculture Scientist, M.Sankar Founder and Director at Sankar Bio-Tech in Hosur, Tamil Nadu, since 15 years. He is interested in Agricultural Biotechnology such as plant cell, tissue culture, and molecular plant virology. He talks at length about plant propagation technology for banana and other crops in a recent discussion.

In agriculture, the foremost important input is the seed and seedlings which should be disease free and of good quality. Farmers facing problems as they do not get good quality seeds and planting material which is a challenge for production and productivity of both agriculture and horticulture crops. Based on the quality material we get we can predict the yield parameters. In agriculture the crops are grown using seeds, while in horticulture sector, the propagation materials are asexual propagation or vegetative method such as tubers, corms, stem cuttings and rhizomes. For strawberry plants there are no seeds, and they are grown using stolen. In floriculture bulbs are used, and orchids are propagated through flower stalks.

In conventional propagation material, fungal, bacterial, and viral disease are associated with the planting materials. So they interfere in the growth and yield of the crop. That is why we should go for plant tissue culture technology and grow in container with aseptic condition in incubation chamber. We grow plants artificially in a medium, providing light, aseptic conditions, free of plant pathogens, microbes, with air conditioned rooms of 26 degree Celsius, and relative humidity of 80%. We can get year round plantlets.

Dr.Sivalingam Elayabalan
Technical Director

It was in 1898 that Haberlandt isolated cells, cultured medium, and grew cells in the medium. One single shoot gave rise to a number of shoots. Similarly in 1946, E.A. Ball found out micropropagation in aseptic conditions for multiplication of plants in artificial environment. Totipotency is one concept. If you take any part of the plant such as stem or root or pollen or stem cells, you can develop a whole plant. We are mass multiplying plant species. In 2011 we incorporated the company. We are certified with seed license, for doing virus indexing and genetic fidelity, and for import and export from Government of India. We are focusing on propagation

of plantlets through tissue culture technology.

The first important commercial fruit crop is banana. We have diversified 1000 cultivars, and there are 40 important cultivars available in India. In South India, there are many varieties such Grand Naine(AAA), Red banana (AAA), Udhayam (ABB) and Karpuravalli (ABB), Virupakshi (AAB), Nendhran (AAB), Elakki or Ney poovan (AB), and Rasthali(AAB). We take the disease free suckers from high yielding elite clones from our mother plant area, test for virus through PCR method, followed to isolate the shoots and mass multiplication in lab condition.

We can get 15 shoots from 1 shoot (15:1 ratio). Then the shoots for virus testing, primary hardening and secondary hardening stage, and final products poly bag stages to reach the farmers for growing. We are currently concentrating on banana, bamboo, ornamental plants, floriculture, and orchids, both Dendrobium and Phalaenopsis varieties. We have inoculation chambers where 19 technicians working from morning 9.00 am to 8.00 pm. We allocate 5000 plants per technician for sub culturing per day. We are maintaining the aseptic conditions, and per year our production capacity is 2 million plantlets. We have a room for aseptic conditions, maintaining scientifically balanced chemicals, and controlled growth hormones.

We take suckers from the elite plant, disease free clones, remove microbes, and keep in artificial medium. Shoot is produced in the ratio or 1:10, or 1:15, and within 9 months we get plantlets. Then we go for hardening, which is acclimatising the plantlets from the laboratory condition to the outside environment. We get well-developed root system, and the plantlets are transferred to polybag condition and are sold to farmers.

We have 13 varieties of banana which are tested. We also give importance to ornamental crops as the entire world is facing oxygen insufficiency due to industrial revolution and automobiles. We are multiplying the ornamental plants for vertical gardening and indoor air quality managament. NASA has studied 13 plantlets for cultivating in Mars and producing oxygen. We are mass multiplying indoor air quality plants such as, syngnonium five types, money plants two types, Philodendrn Xandu, Bamboo, Spathiphyllum and Aglaonema plants.

These are not only for aesthetic value but also to absorb the polluted air and toxins into their cells. We are doing for Bamboo also and supplying for vertical gardening and landscape developers. Once the plantlets are ready, we are hardening, and send the plantlets to the


Primary and Secondary Hardening facilities


farmers. We are also exporting Ex-agar stage plants. The price of the plantlets vary due to the variations in the varieties and the rate of multiplications. We also focus on Philodendrn Xandu which has highest requirement for indoor air quality. We work on bamboo culture, orchids such as Dendrobium for fast multiplication and Phalaenopsis which is tough to grow. We have tied up with a Netherland based company. We do mass multiplying and supply to them. In the culture room, we have to maintain the aseptic condition 100% to be free of microbial population. This is also to completely avoid outside air and pollution. We cannot directly use once out of medium, and we need to check if it is free of pathogens and microbial activity. Only when it is cleared of any pathogens, technicians use it for inoculation.

The various stages of multiplication are: we keep the cultures in the medium. When we get shoots, we go for shoot multiplication, and rooting. One shoot will give rise to 1000 plantlets. We have bamboo shoots, orchids, marble type money plant, golden type money plant, and flowering plants for culturing. We label the plants meticulously which is very important.

Tissue culture is a very tough process involving electricity, manpower, and time. It is a holistic process. If you want to produce a banana plantlet it takes 10 months. Shoot isolation, multiplication, shoot separation, rooting, primary and secondary hardening and well matured plantlets are sent to farmers. Banana takes 10 months, bamboo 6, and ornamental plants 3 months. We have own standardized and optimised protocol 28 numbers. Conservation of medicinal plants and extraction of novel components are our recent developments. We send plantlets to all over India through truck or air. We send 1000 in each box. We also sell low EC and bio enriched FYM with microbial compost. Well-developed root system and plants are important to farmers to increase their production.

We also conduct scientific stalls and farm development consultancy, new lab establishment,Life science student's summer internship programme and training to farming community. We have started using of banana app for pest and disease detection on farm itself our clients through artificial intelligent technology. The farmers by using the app can immediately find out about the health of their crops, apply nutrition, and detect disease and pest any problem with the crop. The app named TUMAINI is freely available in Google Play store, and it is exclusively for detection and control of banana pest and disease.

**Are you handling sugarcane too for tissue culture?**

We are doing sugarcane based on the orders from farmers and stockholders.

**We are using seeds for soyabean and pulses. Is it advisable and economical to go for tissue culture for these?**

For most of the agriculture crops like soyabean and pulses for which the seeds are available to grow plantlets, tissue culture is not necessary. Larger quantity of seeds rate is high in agriculture crops when compared to horticulture crops. Hence it is not advisable for agriculture crops.

**Do you work on banana and sugarcane only or do you take up medicinal plants too?**

We undertake ornamental and medicinal plants too. Based on the orders from people we take up the project and supply for you.

**We have sugarcane breeding institute in Coimbatore. They are developing varieties, but they are supporting only institutes and sugar mills. We face lot of problem to getting varieties from them or sugar mills. Can you help us in this regard? And have you done any research on sugarcane for**

**improvement?**

Sugarcane breeding Institute has improved varieties. If you can get planting material from the mother source, we can get it multiplied for you. From the research point of view, we do not have time to do the research. We have done it and optimised the protocol. We are into the commercial aspects. If you want sugarcane varieties, get us the varieties, and the mother plants, we will do mass multiplication and send you.

Many other countries have developed sugar cane varieties rich in fibre content. We are interested in those varieties. We cannot get them from sugar mills as that is not economical for them and also against their motto. Since we are single farmers, we are unable to get from them. Is it possible from your end? If you can find out some via media, it will be helpful to us.

I can find out from my friend, a principal scientist in sugarcane Breeding Institute, Coimbatore. If they can provide germplasm, we can mass produce and supply you. Please let me know in detail which variety and fibre content you need.

**Other than banana and sugar cane, what other plants you can grow in tissue culture? Since getting genuine seeds is a big problem for all farmers. For any other crops, can this technology be implemented?**

You can go for medicinal plants.

Growth room facilities with 2 million plantlets production capacity per year

In Tamil Nadu, they are cultivating coleus, extracting novel components. The tubers are given to extraction unit to get essential oil. Palmrose for oil and vetiver can also be grown for essential oils and fragrance. In one such company, they are growing and extracting jasmine for fragrance and essential oil which is in high demand in Dubai and other countries. You can go for floriculture, aromatic plants such as mints and greens. You can grow them in growbags with good soil. We supply good quality compost which makes the soil rich in nutrition. Or you can go for coir compost. We use 5 kg bricks for hardening purposes.

**Do you do second hardening for sugarcane?**

Farmers can do the with good compost and chopping the sugarcane. With SSI technology, you can do it in the farm.

**Why are you not into mangos, papaya, and oranges?**

Mangoes and oranges are available only in grafted material. Even forest biotechnologists are looking for tissue culture derived plantlets. We are doing banana and ornamental plants for commercial purposes. For papaya the best variety seeds are available.

**Can you supply cardamom seedlings with tie up with spice board by getting mother source?**

If you can specify which variety you want, we can work on that. We are working on black turmeric and ginger also.

**What is the minimum number we need to order?**

Minimum of 50 thousand plants you can order. Only then it will be viable for us. For green banana the rate is Rs. 15 and other bananas Rs. 20 to 23. Based on the multiplication ratio, price will be fixed.

**If we supply mother source, how long will it take?**

Minimum 10 to 12 months it will take.

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Consultant

# Mallinath Hemadi

Agriculture Consultant. Kalaburgi, Karnataka

He says weeds can be used for economic benefit and the cost of removing them using chemicals can be reduced to maximize the profit. People who have studied agriculture or doing agriculture know that the weeds are wild plants that grow where it is not wanted and in competition with cultivated plants. In reality there are no such plants that are not useful for human, just you need to understand the uses of them.

Direct losses: Reduction in crop yield through competition as they use the resources like light, nutrients, water, and space. Reduction in crop yield and quality through release of toxins. Interference with harvest operations, poisoning of animals, obstruct water flow, loss of water by transpiration, reduce the quantity of water.

Indirect losses: Hosts to many pests like insects, rodents and birds that attack crops, cause diseases in plant and animals.

Non Agricultural losses: Affecting human health like skin rashes and allergies.

**Benefits of Weeds:**

• Many weeds help to conserve soil moisture and prevent erosion. provide food and shelter for natural enemies of pests and alternative food sources for crop pests. valuable indicators of growing conditions in a field, water levels, compaction and pH. Food for wildlife and birds, and sources of pesticides such as chrysanthemum.

• Books indicate that by observing the weeds we can decide on the condition of the soil, crops to be grown, time, and kind of pests that they are handling. Weeds can be important source of food for wildlife, especially birds. Weeds are sources of pesticides, such as chrysanthemum. Weeds add organic matter and nutrients to the soil. Gokhru (Tribulus terrestris) and Bavachi (Psoralea corylifolia) add about 3-3.5% Nitrogen and many leguminous weeds will add about 1.5 to 6% of Nitrogen.

• It can take any time between 100-500 years to form an inch of topsoil on the surface. When we lose the topsoil, it is a great loss to the timeless effort of nature to create it. The natural way is the use of weeds to conserve it. And Currently there is a need to have more livestock, and fodder requirement increases. This huge gap between the fodder requirement and production can be bridged to some extent by using weeds as fodder. Weeds check wind, water, and soil erosion.

• Some weeds are used as leafy vegetables such as Tandulaja (Amaranthus Polygamus), Jangali chaulai (Amaranthus viridis), Chanchali (Digera Arvensis), Noniya or luniya (Portulaca spp), Pathari (Lactuca Runcinata), Sonchus asper, and Portulaca quadrifida. The WHO diet, nutrition, and prevention of chronic diseases recommend a daily intake of at least 400 grams or five daily servings, other than starchy tubers, to prevent diet related chronic diseases and micronutrient deficiencies.

• Vegetables like cabbage, radish, cauliflower and green peas are imported on a large scale. A solution like including weeds as source of vegetables can reduce the imports and can be beneficial to the economy and reduction in malnutrition and micronutrient deficiency. Normally we consume around 20-30 common vegetables but if we use weeds as vegetables, the list grows to more than 200.

• Some of the weeds having medicinal properties are Bishkha (Leucas cephalotes) – for snake bites, Oil of Dhatura, Satyanashi pivala dhotra (Argemone Mexicana)– for skin diseases, Bringhraj (Eclipta Erecta) – for cough and hair, Hariyali (cynodon dactylon) – Bhulokad Sanjivini to treat several health issues. It costsRs. 1400-1600 per kg of powder, and Nut grass/Nut sedge, used for making essence sticks (agarbathis).

• Weeds help in reclamation of alkali soils. The application of powder of Satyanashi pivala dhotra (Argemone Mexicana) @2.5 tons/ha helps to reclaim alkali soils. Certain weeds have nematocidal properties, and many are used to prepare organic pesticides. Weeds like crotalaria spp commonly called rattle pod, parthenium etc. are incorporated into the soil to help control of nematodes. Some weeds are used as natural dyes and for making juices.

• If we kill weeds, we lose biodiversity. To increase the biodiversity there are around 116 schemes identified by the government 24 central ministers and 29 departments. Some of the costs can be reduced. Which saves or adds on to national economy.

So overall weeds can benefit by means of Pest repellent, edible and useful in prevention of soil erosion, habitat for beneficial insects, predatory insects. One example can be Bermuda grass powder can be used at home for many purposes and its powder form has market value of Rs 1500-1600 per kg. Means 4 to 5 Kgs of it will be equal to 1 bag of red gram grains. When we use the weeds wisely, we can manage human health and agricultural field's health also.

Still if we need to control weeds, Meth-

ods followed today include mechanical method, cropping or cultural methods, biological methods of weed control, chemical method of weed control.

If we use chemicals we lose many beneficial insects - among the insects, 80% are beneficial and 20% are damaging. If we use pesticides or herbicides to get rid of these insects or weeds, we are also damaging beneficial insects also one among that would be honey bee population. Just one hive in the field will increase Red Gram production by 10%, sunflower production by 25%. and 100% for cucurbit vegetables. Imagine the loss if we lose bee population.

In spite of these issues and losses, we need to get rid of weeds, to do that we need to learn to understand them and get benefits out of them. We know that weeds are not "unwanted" but "less wanted". We can use as vegetable, harvest the weeds in their early stage before they reproduce, so we get less seeds, use as fodder by means of grazing, let the cattle graze before the crop flowers. Stop using chemical fertilizers to reduce cost of farming instead go for organic farming so that you add more of organic content in soil making it rich and reduce weed growth. Use weeds as medicine both for human beings and animals to get their value. And choose crop based on the weed types in the soil.

Along with the main crop, we can also manage and use the weeds for food and medicinal purposes. You can read the books "Weeds are the Guardians of the Soil" and "Alternate to Chemical Farming", second one written by me, on how to use these weeds in various ways. Ever since green revolution started, there is extensive use of chemicals, herbicides, and pesticides in the soil, and studies show these chemicals cause Cancer. So at least now we need to act to reduce use of chemicals and for this we need to understand uses of weeds and start taking benefits of it.

**How do we identify weeds with medicinal and nutritive qualities?**

Currently it is based on the virtue of experience of local people and word of mouth. Even animals can guide us. Also, you can consult any Ayurveda expert in your locality. We are working on a book with more information on weeds cataloguing and how to use them.

**Would there be any adverse effects if we consume weeds that are not to be?**

Yes! Usually weeds that release milk are dangerous to eat and also thorny weeds.

**Can you give reference of the books those you mentioned?**

There are several research papers those are available on the internet. You search for "Weeds as Food", "uncultivated food", "uncultivated vegetable" etc

**How to control Nagarmotha (Cyprus rotandus), a densely grown weed without chemicals?**

This is a very valuable weed with fungicidal property, its presence in field will manage soil borne fungi diseases. This is also used in the agarbathi industry. Due to the fungicidal property, this was placed in the cow shed or sheep/goat shed which is to manage fungi disease in animals also this is to get mixed up with cow dung/urine and when this compost was applied to soil, soil is to be benefited and in turn crop yield.

**How do we tackle weeding issue in organic farming?**

They have successfully tested an organic herbicide with salt, cows'urine (2-3 lit cow urine + 2-3 KG of Salt in 8 lit of water) to be sprayed only on the weeds. Once you identify the weed and start using them for food in the early stages of life, the number of weeds decreases.

**Does glyphosate get converted to readily available phosphate P2O5?**

WHO says they cause cancer. It is banned in several parts of the world. Understanding the requirement of phosphorous is complicated. The negative effect of glyphosate is it reduces the next crop.

**While starting Organic farming, how to make sure that there are smaller number of harmful weeds?**

We applied only "Jeevamrutha" and pesticide. Plants get affected only if the shadow of weeds falls on the crops. If this is not the case, there will be no issues. With intercropping, weeds growth is curtailed. When continued for 2 or 3 cycles, the weed growth will be reduced.

**Parthenium – is it a weed? Is there any use out of it?**

Parthenium is a dangerous weed. They have started to use that as pesticide. When you weed before flowering and put for mulching purpose, the number of plants will come down. There are specific insects that kill parthenium.

**Weeds as nematicides – can you explain?**

Parthenium and madhar / safed aak (Calotropis gigantea) are used in paddy

fields as nematicides and to increase the pH of the soil. Decompose the weed in water and make it to a kind of slurry/liquid and mix it with 1:10 water and spray. Milky weeds and bitter tasting weeds can be used as nematicides.

**How is the soil condition affected by using glyphosate?**

Using glyphosate will kill the weeds and also must be affecting the soil microbes and insects, thus affecting the soil condition. So, after some time we cannot cultivate any crop in the soil. We have to change our thinking that weeds are not needed but use them for their benefits.

**Can we use the latex from Calotropis gigantea to spray on mealybugs?**

We have not personally used them, but you can try using it and because it is an insecticide, it may help in controlling that bug.

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# Ganapathy Ajeethan

MD, Tamil Nadu Banana Producer Company Ltd,
Namakkal, Tamil Nadu

**He says the change in mindset of farmers will help earn millions in Banana cultivation by adapting modern technologies and cost effective value addition of banana using solar energy. He talks in an interview how the latest technologies have changed the lives of millions of farmers.**

There are 47 banana growers group and 4 societies in 12 districts of Tamil Nadu joined hands to form our company. Banana is an intensive crop requiring lot of nutrients and water. But the sad part of it is the low market realisation, wind damages, disease, and pest problems. The amount of investment is high, and so the farmers have to adapt latest technologies right from cultivation till post-harvest management to get more revenue.

Tamil Nadu, Gujarat, Maharashtra, Kerala, and Karnataka are the major banana producing states. The Grandnaine or Cavendish is the most grown variety and nendran variety in Kerala. The propagation of banana through daughter plant from mother plant using it as a seed to grow the plant again was spreading lot of diseases and pest attack across boundaries where the seeds were distributed. The tissue culture technology produces seedlings, and this helps farmers grow high yielding varieties like Grandnaine,red banana, Nendran and double their income. Data shows from 2010 the yield has almost doubled from 4 to 6 tons to 15 to 20 tons per hectare. This high production is achieved by tissue culture and other technologies like fertigation and drip irrigation.

Even though banana production has increased, there is a problem in getting a good revenue from the harvest. From harvesting of branches till reaching the customer, we can see the loss to be around 30 to 35%. The farmers are forced to settle with low price, and the bitter story continues. When the produce is harvested and taken to market, due to poor logistics, the produce is spoilt or damaged.

## How to improve the yield and profit?

The state has poly clonal cultivation with 10 native varieties grown in 18 districts which is spread over to clusters. 10 to 12 varieties are grown throughout the year. But if you see the mindset of the farmers to adapt modern technologies, there is a sea of changes due to research institutions and universities that suggest cultivation and production techniques to farmers to improve the productivity of good banana. The supply chain link is there right from harvesting, carrying, loading, taking to market, unloading, dehanding, ripening, and then transferring to small traders and customers, which is again a challenge.

The fragmented land holding of farmers with maximum 1 hectare is another problem, a weakness in concentrating on the productivity. The industry was unorganised till 2004 when the research institutions in Tamil Nadu started sensitising the farmers to form the organization. They were formed as federation, clustered in and around different areas, federated, and big organisations formed to represent to the government on priorities. There was no trust and transparency among stakeholders. Inadequate infrastructure was another problem hampering all fruits and vegetables in sending to the market in proper shape. Lack of post-harvest technology, taking forward pre-harvest technology, arriving at exact methods for bunch cover, bunch care, fruit care, and other technologies in getting right maturity of fruits to be acceptable in the market existed.

## Poor logistics

There was misleading database on area, production, and markets were not accessible to data, apart from sucker propagation, flood irrigation, bunch transport, bunch loading, and condition of soil not fully studied. Soil testing was not done in a periodical way. So the farmers were not aware of complete set of requirements for the plant in terms of micro and macro nutrients. The yield levels were static at 7 to 8 mt per hectare. When it came to post-harvest, the ultimate loser was the farmer.

After 2004, with the advent of tissue culture technique practised by big agro-corporates like SPIC, Jain irrigation , AVThomas and company,, farmers got a great awareness on banana, by adapting the modern techniques such as tissue culture seedlings, drip irrigation, and precision farming. They also learnt about soluble fertiliser use, post-harvest care, bunch care with uniformity in the farm. So they started getting better revenue.

In post-harvest measures, packhouses or farm laid packhouses got huge importance. You can visualise the damage to the colour and quality of produce after harvest when it is loaded and taken to market. So it should be harvested, dehanded at the farm level itself at packhouses, packed in crates, and carried without human touch. It saves good yield and income for the farmer. Scientific estimate finds during conversion of fruits from bunches to boxes, there is quantum increase of revenue to farmers to the extent of Rs.1.5per Kg of fruit.

You can calculate the extra revenue for a produce of 15 tons. Whatever the revenue earned by the trader himself will be passed on to the farmer to that extent by adapting the latest technology.

In Theni cluster, the farmers were following planting, using flood irrigation, manual nutrition application, and the yield was 7 to 8 mt. Now they have started adapting latest technology such as drip irrigation, fertigation, post-harvest fruit care, and bunch care, and the revenue has tripled in the span of 10 years, from Rs. 50 thousand to Rs. 1.50 lakh.

After having tasted the profit the farmer gets by adapting the latest technique, the production volume has increased from 7 thousand acres to 26 thousand acres in one cluster alone. Such latest technology helps in saving water, no loss of nutrients as it is given through drip irrigation, and spot fertilisation in a fractured manner every day. The plants yield in a uniform way. The dehanding of bunch is a harvest using plastic or nylon rope and not with knife.

Some farmers and traders started in a small way to make use of cold storages and ripening units in growing clusters. Within 4 or 5 years many cold storages and ripening chambers have come up in one district alone. The farmers supply to packhouses, cold storages, and ripening chambers located in production centres where the fruits are directly transferred to cold storages in crates, packed neatly, and kept for ripening. The capacity has now gone up to 15 thousand mt.

In a ripening chamber, ethylene dosage is triggered inside the chamber, and the fruits slowly ripens. They get the uniform colour, and there is no toxicity. The fruits ripen within 72 hours and taken out for sale to the markets. Since the supply chain management is reduced, farmers get more income. Packhouses and the infrastructures are at the farms itself. With financial support given by banks and other institutions, the buyback arrangement by the traders happen automatically, and they pay a premium price. While the overall market price is Rs. 12 to 13, the Theni farmers get Rs. 15 a kg. Average price is assured to the farmers.

The surplus produce can be stored and sold later without any damage. Post-harvest loss is reduced to 5%. For the consumers, high quality produce with less toxins, no price fluctuation, naturally ripened fruits of international quality, and uninterrupted supply all through the year are the advantages. Since the per capita consumption of bananas by Indians is very low, we can sensitise them about the volume

## Q&A

**Can we put the solar dryer in small units?**
Solar dryer using polycarbonate dome can be built in the farm itself. Mobile dryers are also there. To construct a small dryer of 500 sq ft and civil construction for the same will totally cost Rs. 10 lakhs. You can have multiple or single layer of dryers inside the dome. You can dry 1 ton of banana, and within 40 light hours, you can produce 200 kg of dried fruits. If there is a glut of fruits, they can be dried and stored for 3 months. The dry fruit segment is inspiring. You can sell the dried fruit for a higher price.

**Is it possible to go back for rehydration after the dehydrating process?**
No. Once the fruit is dehydrated, water goes off. The fruit will not get its shape back. With almost 15% moisture, you can consume 4 to 5 bananas also in a day. You will get all the required nutrient for the day. The fruits will retain the same length, and only water is removed. It will look like a flat piece.

**Is it the ripe banana or the raw banana to be used?**
Ripened and unsold surplus fruits can be used. The skin has to be removed before the process.

**Is it economically viable?**
Yes. Earlier we did not have the data about the product, quantity, and number of people growing. If they come united, they get all the data. Unless market information is available, it is difficult. In BARC, the technology of solar dehydration to powder the banana is available. Karpooravalli, Poovan fruits are more suitable for solar dehydration.

**How to prevent nematode problem?**
You have to use paecilomyces lilacinus along with farmyard manure at the time of planting of seedling. You will get the result to ward off the problem. You can also contact NRCB. Trichirappalli for more details

of production, resulting in benefits for both the consumer and farmer.

When you really want to get the market information and bargaining capacity, you need to group together. After 2005, the research institutions came up with lot of programs to increase the capacity which had the impact on farming. If the farmers come together to have a small farmer producer group or federation, or association, we have a quantum advantage. We can negotiate and plan the production schedule. There are a few value added products from banana. Tamil Nadu banana producer company has ventured into solar dehydration of the fruits. We can install the solar dryer in the farm itself. It is a drum or a polycarbonate dome of 4 to 5 hundred sq ft with photovoltaic ventilation.

The polycarbonate sheets are coated with ultraviolet screen so that the impact is not on the fruits. We can dry the surplus or unsold farm ripened fruits to make a very good dry fruit which fetches more money. The Thottiam Banana Producer group started this, and they are the first group to sell it online. Some producer group also make weaning food, sugar free porridge powder, and banana progeny powder. We can have all the value added products pooled and marketed at a suitable place so that each farmer gets good revenue and no wastage of ripened fruits. Jams, powder, chips, juice, wine, pickle, candy, and fibre are the other value added products. We can cater to the banana requirement of the whole world if we focus on the pre and post-harvest production, adapting new technologies, and infrastructure.

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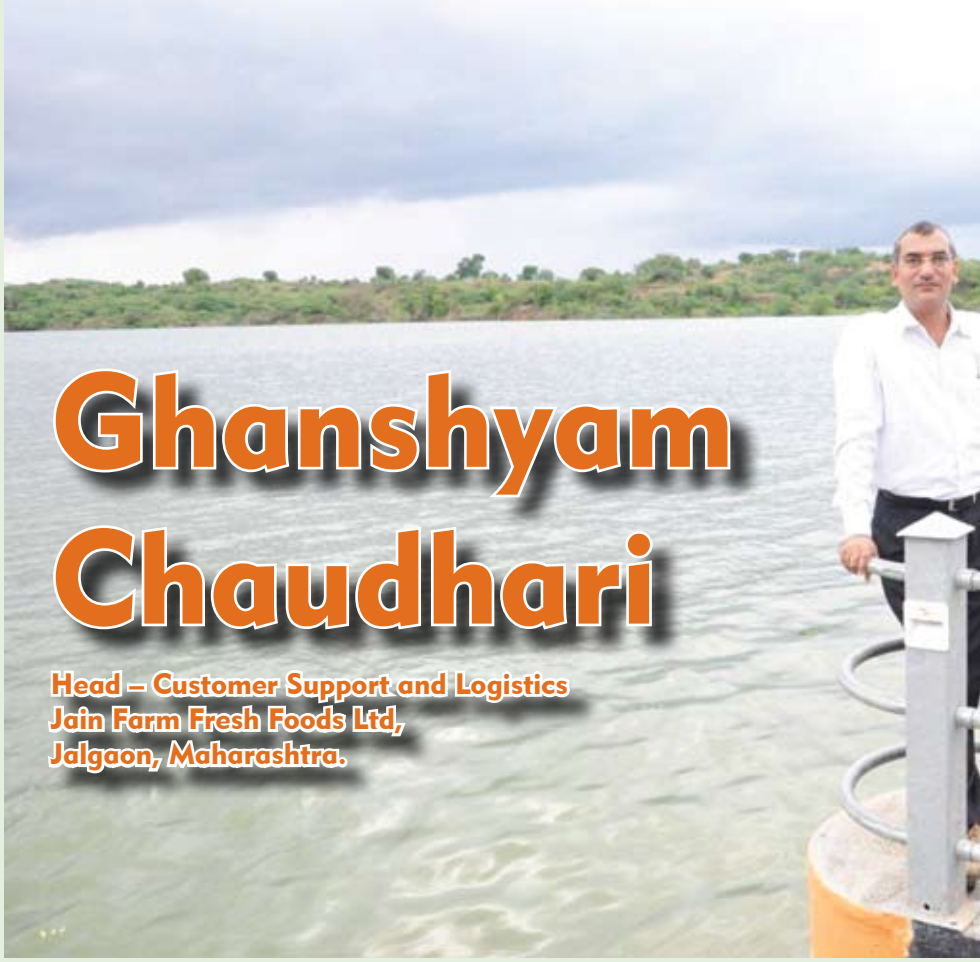

# Ghanshyam Chaudhari

**Head – Customer Support and Logistics**
**Jain Farm Fresh Foods Ltd,**
**Jalgaon, Maharashtra.**

The company is a largest dehydrator of Onion and Vegetable. He has a long experience in dehydrated onion& Garlic processing. In an interview he talks about how Onion and Garlic can be dehydrated and various products can be made available for international market.

Onion (Allium cepa L) & Garlic (Allium sativum) both are the most popular and equally important spices in the world. These spice commodities are used for flavoring the dishes. These are valuable medicinal plants offers many medicinal properties. The demand for the processed products is increasing day by day due to its convenience to store, handle and use. Onion & garlic can be processed into a wide variety of products. Many products can be manufactured from Onion and garlic like dehydrated onion or garlic, garlic powder, onion and garlic oil and others.

Annually 60 million tons of onions are produced, with the crop being grown across 7.4 million acres in over 134 different countries. The production of onion is doubling in world over the last ten years. Biggest producers are China, India and United States, accounting for about half of the world's onions production. Other countries, with annual production figures above 1.1 million tons, are Brazil, Iran, Japan, Pakistan, Turkey and Russia. The current average world yield stands at 7.6 t/ac, but highest average yields of 17 - 26 t/ac are found in Korea, Japan, Europe and the USA. Leading growers can produce crops that exceed 44 t/ac. Between 15-18% of onions are processed in various forms, used in seasoning mixes, pre-cooked items, soups, relishes and sauces.

The demand and requirements for onion is almost constant throughout the year, where as availability is limited to 7 or 8 months and there is lean periods when prices shoot up because of poor storage conditions available in the country. About 15-20 % loss due to Poor storage. Farmers are forced to dispose their produce by distress sale. Above aspects shows potential & need for processing and value addition

If we intend to solve the problem of onion and garlic shortage and avoid the issue of drastic fluctuation in prices of onion. Dehydration of onion is the only answer.

Onion and Garlic are used for flavouring dishes and most of the Indian recipes are onion and garlic based. Since you cannot store them for long time, they have huge demand all the time.

The biggest producers of onion are China, India, and USA, apart from Brazil, Iran, Japan, Pakistan, Turkey, Russia, and France. India has low productivity of onion and garlic, but due to its pungency, it is preferred in the world market. Onions can be processed into variety of products such as ready to cook onions, onion paste, onion flakes, onion powder, onion oil, onion in vinegar, onion sauce, pickled onion, and onion wine and beverage. Dehydrated onion has value in onion flakes and powder.

In dehydration technique large volume processed and reduced to 7 to 8 times, which is beneficial for logistics and saves money on transportation since the volume is less, considerable increase in shelf life of about 18 to 24 months, very convenient for cooking and no wastage is there. It prevents fluctuation in prices too.

## Processing highlights of Jain Farm

One of the largest onion processor in the world, two plants in Jalgaon and Baroda in India and one in Oregon State in USA which process 50 thousand MT onion per annum, world class, ultra-modern, integrated agro processing plants with maximum mechanisation, located in the midst of large onion and vegetable cultivation areas, thus saving transportation cost, working with 5 thousand farmers on contract basis, total agriculture value chain from seeding to processed onion for sustainable farming, certified by BRC, ISO 14001, OHSAS 18001, Halal and Kosher, 5 thousand MT storage capacity in Jalgaon and 700 MT in Baroda, and storage to keep the processed produce in cold storages.

It is beneficial to farmers as short duration crops. Onion comes in October middle, late winter, and summer. It requires very less water and fertiliser. It is a cash crop, and so farmers get their money. It has an ensured market, and so it never goes unsold.

Globally white onion has more demand, but India grows red onion. So it became a necessity for Jain Farms to get more white onions, and so it developed its own variety based on the American variety. We grow white onion in 250 km radium from Jalgaon. The prerequisites for a world market are: colour, no foreign matter, good microbiology which does not spread diseases, no black spots, no shoot from the centre of the vegetable, compliance to international food regulations with regard to pesticide residue, heavy metals, and allergens.

### How onion is processed

- Raw onion comes to factory, red onion is separated from white onion, and rotten ones removed and received at sorting area
- Cleaned with mechanical cleaner, washed, and disinfected
- Visual inspection is done
- Onion is cut and fed to drier to reduce moisture from 18% to 5%
- Dehydrated onion is fed to mill to get uniform particle size, and generated as flakes and powder
- Passed through magnet separator and metal detector separator to prevent any particle during processing. Two types of driers, single pass drier from USA and multi-pass drier from Germany.
- Colour sorted to remove black spots, packed in boxes which again go through box metal detector, and sent to warehouse for storing

Product range includes: sliced onion, cubed, chopped, minced, granulated, standard powder, toasted onion products, and custom made ones. If you subject to high temperature for some more time, the sugar in the onion will be caramelised and gives you a different aroma and colour. There is huge demand for toasted onion powder and flakes in European countries. Some companies like Nestle and Pepsico need red onion cube minced, standard powder, and custom made. The plants in Jalgaon and Baroda have 5 parallel lines to separate red and white onions.

Food safety during onion processing is very important. We have to ensure the safety of the consumers. It is taken care of in the field and at the factory. Food safety is an assurance that the food supplied to the consumer will not harm them when consumed. It makes the farmers start the approach from raw material till consumption point.

To maintain the food safety at the field level, we have contract farming module. We do survey of onion fields, crop status, expected quantity, market outlook, price variance, quality of the produce, pesticide used, analysis

region-wise, and agronomist farmer relationship and trust. Jain Farms follow Good Agriculture Practice in accredited lab. Since our farmers are small and poor, they cannot cope up with the global GAP. We implement the practice in our contract farming fields.

To implement GAP, we employ about 55 agronomists placed in the villages where the contract farming of onion is done. They need to visit the farm

once in a week at least and advise them on how to manage the crop, how to handle contamination, about pesticide to be used and in what quantity, and which ones are to be used and the ones banned by the government. We give the farmers training, guidance, soil and water analysis, protective clothing, containers to store pesticide, first aid kit, signage on farm, record book, and farm manual about managing crop during processing.

We conduct meeting, group training, individual training, seminars, and exposure visits. We advise them to sow seeds directly in the soil which saves time, growing cost, and transportation cost. We implement the same for mango also. We work in Chittoor near Thirupathi. We have received certificate from Unilever for the sustainable supply.

Jain Farm complies with: Coco Cola's sustainable agri guiding principle, Sustainable agriculture initiative, Unilever sustainable agriculture code, McDonald's agriculture assurance program, and Danone's sustainable agriculture

Farmers are benefited in many ways with increased production, quality, and safe food, soil, and water analysis report, timely application of water and fertiliser and safe handling, reduced cost of cultivation, proper pre-harvest interval of agrochemicals, use of protective clothes, ensuring health, safety, and hygiene, farm records, dependable sustainable resources, and food safety at the factory. We make sure that the products are free of any hazard and allergens.

**What is the demand for onions once they are dehydrated?**
There is international demand for white onion, and red onion is table onion. But white is preferred internationally as it suits any recipe

**Why does the volume go down?**
The 85% moisture in the onion gets reduced to 5%, and so volume is reduced.

**Why not much demand for dehydrated onion in India?**
The demand in India is increasing. We are selling 15% here compared to 2 or 3 % sometime back. People are understanding the benefits of dehydrated onions as they have better shelf life, storage convenience, and no wastage. You can soak dehydrated onion for a few minutes and use it in any recipe.

**How is the price of red onion decided?**
We work with contract farmers with minimum guaranteed price. If there is fluctuation, we have to buy at that price.

***Do you help private labelling manufacturing?***
For some big companies we do. We are b2b processors, and we do not pack them for retail market. We supply in bulk packages.

**How do you manage the MRP of dehydrated onion?**
We are b2b processors, and MRP does not apply to us as we do not sell in retail market. We make annual contract with customers who buy in bulk from us, and the annual contract price is based on the onion price which fluctuates. The business is quite challenging due to the fluctuating prices.

**Any possibility to grow onion in organic way?**
We have not gone for organic cultivation because of the many challenges involved.

**What is the cost of setting up one unit for dehydration?**
The cost of unit depends on the equipment we purchase and extent of processing you want to have. Some processors only dehydrate, and product sent to others for milling and further processing, and some will have all the facilities. In Gujarat, crude designed driers are there, and they are cheap.

**How your unit in USA is different from Indian units?**
There is no difference. It is the version of customers in USA and Europe that our Indian units are better than the USA unit.

**Which variety of banana you take for contract farming?**
We get cavendish variety for processing by both contract farming and from outside market.

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# Balamurugesan RM

## Modagam Organic Farms, Madurai, Tamil Nadu

**Worked as a technology sales consultant and worked as business development manager, data centre, and cloud managed services for 15 years before shifting to agriculture and running a successful farm. He talks about his success story of shifting from IT to organic farming to direct consumers.**

It is a farm of 20 acres with 4 borewells. Water availability is less here, and so we connect all borewells to one well, from there we use drip system. We use venturi which supplies fertilisers to plants. We have fenced the farm. As of now, we have 1400 guavas – Arka kiran variety, and 1400 papaya – red lady variety, 5 acres of barnyard millet, and 6 acres of corn, the last two being rain fed cultivation. We have 20 goats and 20 honeybee colonies to help in pollination.

The guava saplings have been planted with 6 x 6 spacing as it is a high density farming. We prune the trees to keep the height at 6 ft so that some part of the farm is towards flowering, fruit bearing stage, and pruning stage to streamline revenue throughout the year. We number the goats so that it is easy to calculate weight and food conversion ratio.

Pest control measures are essential. We use natural and manmade fertilisers such as panchakavya, jeevamritham, meenamilam, theymore karaisal, and erukku karaisal. We use pseudomonas, bacilius suptilus, verticilum lekhani, EM, and WDC available in the market known as insecticide or pesticide that are organic.

We learnt to make natural fertilisers by composting farmyard using cow dung. For one tractor load of vermicompost, I use 2 kgs of azospirillum, pseudomonas, neem punnakku, pungam punnakku etc. It is a 21 day process. When water is mixed and left, it becomes a very good fertiliser with all organic factors. Meenamilam is the debris of fish from Sunday market. I mix equal amount of base fish and jaggery in a closed bottle, after 21 days it is full of urea. Jaggery is the only thing I buy, and the rest are waste products. We have made automation to lessen manpower and utilisation factor to reduce cost.

We have prepared schedule for papaya. I use a mechanical spray with high pressure to throw lot of fertiliser. The interesting part of organic fertiliser is that even if more is applied, it only helps the growth of plants. Within 2 days, the schedule for guava and papaya is completed. Jeevamritham and micronutrients are the combination to give in water. The venturi in drip irrigation sucks the liquid manure and gives all plants through water. Since all the fertilisers are liquid based, with the filters I have put, nothing stops. There is a man to open the gate valves. Weedicide is not used as it kills the soil and microorganism. We use a power weeder 4 stroke 5 hp working on petrol to remove weeds.

I have one drum for fertigation, have gate valves opened and the water goes into the system, and venturi takes over. With the resting period of 2 to 3 days in the drum, the water becomes nutrient. We have implemented infrastructure to do small amendments.

**Challenges** – arkakiran is a Bangalore variety. The size is of 100 to 120g. It is of small size, with lot of pulp, and sweet red variety. We have to prune the branches as guava does not give new fruits from the same branches. We found a way to get rid of the infection in guava with a fungicide. Packaging is another issue. We have something called jacket where the fruits do not touch on sides and the skin not affected when transporting. Sales is also tough with middlemen and aggregators who offer a low price. The logistics has to be managed.

Payment follow-up should be handled.

**Tools** – it reduces manpower and helps us to do optimisation on the system. We use a 5 hp machine which is petrol operated, a 4 stroke power sprayer to carry the 200 l drum to anywhere in the field. It has a cable of 30 mt with guns attached which men use for spraying.

We have drip irrigation facility also. There is a fertigation tank of 1000 litre capacity to mix the ingredients, and we make sure they get dripped to all locations. CCTVs are installed for monitoring. We have an auto start motor condenser to switch on the motor and switch off when power goes off. It runs automatically and is connected to multiple borewells to well. The borewells are connected to motor.

**Pest control measures** –The more cost conscious you are, it is easier. We have 100 or more use and throw bottles with small holes, put dry fish with some water. It gives a bad pungent smell that attracts lots of flies which affect plants. They get destroyed within the bottle. But honeybees are not affected by this.

**Online order booking software** – you can achieve major success in organic farming when you directly meet your customers to get business. An app powered by Instamojo is used by us where our products are listed on the page. We have installed the app to connect to customers by WhatsApp and Telegram within 50 kms. They give orders and we deliver personally. The payment is done via any digital payment.

**Farmers app** –It gives data about the expenses made for the farm for each product. I should know the price I have sold the produce. Cash movement is entered. The app is nominally priced at Rs. 400. We can update the data on xl sheet also.

**Invoice generation** – Mybillbook is an app to generate invoice. I use this app for b 2 c customers. They can do the individual orders in Instamojo. When I deal with fruit shops who order in bulk, I ensure that invoice soft copy is sent via WhatsApp. I know what is outstanding as it is a credit system.

**Weather forecasting** – Climacell helps us to get reports about weather. With 60 to 80% accuracy level, I plan my activities accordingly. I also get 14 days analysis on what to expect in weather.

**Organic journey** –The better we are with customers, the more advantageous. We are able to cut short retail, middlemen, to get profit. Next year, I plan to dehydrate the unsold fruits and sell them at premium. Customers visit our farm, happy to interact with me, and take the fruits. I plan to create a 500 customer base, put the details on the app once harvested, sell a major portion at a premium price and the rest at the price offered to b 2 b customers.

**What is the cost of production for each crop?**

I have done it for the major crops. For millets, I have entered the expenses. I have not done any cost analysis. After the harvest, I am trying to check if I get the profit.

**Is it possible to have a basic cost for crops?**

I do not have the visibility on that as I am new to farming. I do not venture into vegetables as I need have multiple vegetables.

**Are you selling at market price? What is the cost of Redlady papaya?**

Yes, I am selling at market price, and premium cost also because it is organic. I would sell a kg at Rs. 15 to b2b customers. If I sell directly to a customer, I sell at Rs. 35 to 40 per kg.

**How many acres of guava and papaya you have?**

We have two acres of guava and 2 acres of papaya, each 1400 plants. They are high density plants. With 6 x 6 spacing between saplings, I restricted due to reasons like vehicle movement to carry the produce outside.

**What is the accuracy of Climacell app?**

It is about 60% accurate forecast. If there is a forecast for rain, the system triggers about it. I open the app every day to check. It helps me to organise work, like getting tarpaulin ready, and somebody else can do it during my absence.

**What are the procedures for papaya cultivation?**

We make pits of 1.5 ft depth 1 ft width, leave for 10 days to dry, and fill with cow dung manure compost. We get saplings from Periyakulam. Papaya grows in a higher level with good water management. If water stayed for a long time, the plants were affected by stem rot and root rot. Once in a month we spray

pseudomonas to help roots and clean leaves. For mealybug on guava, we use fungicide. We plan to go ahead with light trap.

### How do you manage the rot and ring spots?

No ring spots. We have seen stem rot, root rot, and tree fall with fruits. We are in touch with Mr. Britto Raj who manages an organic Telegram group of 14 thousand farmers. I send photos to him in case of problem, and he gives suggestions.

### How do you manage manpower, water, and electricity?

We have labour from nearby villages. They support and update saying about their availability in advance. We need 4 to 5 employees every day. On special days like fertiliser or manure applying we need 10 or 15. We have given them the freedom to stay in our farm. They should report when they get job alert and get back. They get salary from the government and me.

Since we have drip irrigation, we can fertigate our lands for 8 months in a year. For the 2 ft root size of our plants we have more water in this region. We can get 15 thousand litres an hour using the submersible 5 hp pump we have. We use 1 to 2 hours for guava and then it goes to papaya from 3rd day. The 5 compressors will work 24/7 in my well. By 2 or 3 pm, we switch on the pump, drip for 2 hours and shut down the gate valve. 2 hours of 30 thousand litre water supply is enough.

### What are your future plans?

We plan to have sericulture for our monthly revenue.. Sericulture should take care of monthly revenue. Fruits are interim arrangement. I am working on revenue and profitability.

### Can you design for 50 acres?

I can give my design for 4 to 10 acres. I don't have visibility if I can grow guava or other fruits. You can grow 1500 plants in each 2 acres and have rotation. I am not sure if growing 10 acres of guava will sell in one single point of time.

### How many manpower you need in a year?

On an average we need 60 to 100 manpower, mainly women. I don't cross 60 or 80 in a year. With mechanisation, we need less manpower for specific purposes.

### What is your advice to someone who wants to take up farming?

Supporting family is essential. Cash resource should be available. In agriculture we need to keep investing more. If you have back up, you can take up agriculture.

### Cost of investment and return from a 10 acre plot.

Main investment was on fencing and water. We have installed borewells, fencing, samplings. I cannot see a ROI specifically. Overall investment is still negative. I have not got any positive result.

### Special efforts to maintain soil condition?

I have used jivamrutham, organic manure, cow dung and cow urine. I have noted lot of earthworms in rainy season that help in keeping the land healthy.

### Land size for a starter?

Land size does not matter. You need to plan what revenue you expect. You should be ready to do all chores in case of need. I plan to grow silkworms in 12 acres. I can raise 400 eggs in 4 acres and going by protocol, get Rs 40 thousand per acre. After the expenses, the profit is a stringent number.

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# The Time for IndG.A.P. is now

According to recent research by Aditi Organic Certifications, over 92% are aware of organic products mainly in the category of fresh fruits & vegetables. Over 57% stated inability to identify genuine organic products for their decision not to go for organic. When people talk about "organic," there is a need to check whether the producers have followed Good Agricultural Practices.

To address this concern, the Quality Council of India (QCI) has introduced a voluntary certification program called IndG.A.P.

Organic farming with Good Agricultural Practices (GAP) can be optimised to meet particular goals. Profitability is usually an important goal, since without profit you can't keep farming. Integrate IndG.A.P. with organic farming can help to prevent certain environmental problems.

Introduce IndG.A.P. to small and marginal land growers can prevent on-farm contamination of fruits and vegetables. GAPs are a new way of thinking about food safety. Good agriculture practices are also use to maximize the farm produce in different ways and quality production. Farmers can do self-assessment and learn about potential food safety hazards that can occur on the farm or orchard and take preventative steps to avoid contamination with harmful microbes and chemical residues. IndG.A.P. certification may protect your business. They not only prevent the public from illness, but they also protect your farm business from the economic consequences of food contamination

### What is IndG.A.P.?

IndG.A.P is a voluntary certification scheme developed to certify Good Agriculture Practices (GAP) in India. The scheme is to promote sustainable agriculture to bring in culture of food safety, enhanced produce quality, optimization of human and natural resources by our agrarians. This is turn will result in better price realization of their produce and thereby secure and strengthen livelihoods of the small and marginal farmers.

Following general modules are developed under IndG.A.P.

a) All farm base module

b) Crop base module includes – Fresh Fruits & Vegetables, Combinable Crops, Tea, Green Coffee and Spices

c) Agro Biodiversity module

The main components of IndG.A.P Standards are

• Soil amendments & soil fertility management including INM

• Planting Material including seeds and vegetative propagation materials

• Water management

• Pest & disease management including IPM

• Worker's health and safety

• Harvesting Practices and maintenance of good sanitary as well as hygienic condition at field to final packing stage

Organic farming and IndG.A.P. certified products must be marketed to ensure the consumers are getting products, which are grown with the least risk of cross-contamination from any of the possible contaminants. When it comes to the production of fresh fruits & vegetables, assessment of farms with IndG.A.P. certification criteria helps the farmers to guarantee consumers the efforts taken to get the farm IndG.A.P. certified and get a better price for the farm products. According to the same study, over 60% of consumers buy organic products on a daily or weekly basis. This could be beneficial to farmers if they can convince the end consumers of the quality and authenticity of their produce.

IndG.A.P. certified products must be grown for local consumption to reduce food-borne ailments. People think anything green, fresh is organic and farmers do not see the need for certification if it is just for local consumption. Our studies show that over 54% of consumers do not know the difference

between "organic" & "natural". Do we not care about the requirement of such certification by a third party to ensure that what we consume as organic is authentic and chemical-free? The local consumer must increase the consumption of certified products and pay a better price. This will encourage the local farmers to embrace such certification while following good agriculture practices.

### Why should we insist on buying organic/IndG.A.P. certified products only?

This will secure and strengthen livelihoods of the small & marginal farmers. The certification process helps to define measurable improvement in terms of increased productivity, quality of the produce and income level. If the product is certified, buyers have to simple order such health products by looking at the IndG.A.P. logo as the produce and certification process ensure on all quality aspects which the buyers are looking for.

In the case of small and marginal landholdings, the farmers are unable to market their products directly to consumers. They may need support from a middleman or a consolidator to bring the farm produce to the consumers. IndG.A.P./Organic certification helps farmers to communicate: the value of their time spent in taking extra care of crop production, the extra money spent to maintain minimum infrastructure to mitigate the risks of cross-contamination identified during self-assessment and external inspections.

The State Governments can play a key role by supporting farmers to go for such certification to market precious produce in designated hygienic areas. Marketing such certified products in designated areas help the farmers to adopt chemical-free farming and utilize natural resources judiciously. We have recognized a small farmer who is selling INDG.A.P. certified products to small markets.

Trust factor goes a long way while buying day-to-day food items. Most of the small shop keepers presume that if a vegetable comes from a local farmer or a traditional farm (meaning not certified), they may consider the freshness and price factor. The importance of ecological and environmental effects to the local community is considered additionally in the case of certified products.

### What is the role of the consumer?

We will talk of distance market demand, every consumer must be aware of the traceability of the product, whether it is a supermarket or retailer. The consumer must be able to track the entire journey of the product- trace back to the concerned farmer to prevent if there are any quality issues noticed by consumers. Consumers must look for a certification mark and be willing to pay a premium or reward to the farmer for helping them to have access to healthier farm produce.

Here comes the role of a third-party certification body like Aditi Organic Certifications, to verify and assure the consumers that certification is important. Certification helps the farmer to sell his farm produce for a "better" price with minimum wastage at every stage of product handling. The pandemic has taught us that in the future, what we eat will play a key role in building our immunity against microbial (bacteria/fungus/virus) based diseases. Hence, it is all the more important that we must help the farmer to grow and market directly to consumers with certification of quality assurance.

IndG.A.P. certification also helps the legally registered farmers group to apply for certification. Only by robust planning of production, consolidation of farm produces, a group can develop a sustainable business module to and ensure regular supply of better and healthier produce to its consumers. As a consumer, one must look into these factors.

- Must interact with farmers and read about the difference between conventional produce and certified ones
- Must identify certified produces to support farmers' groups and buy from them or ask their local retailer who supports the indG.A.P. and organic agriculture.
- Must know the difference between indG.A.P. (Good Agricultural Practices) and Organic Farming Practices.

It is the need of the hour that consumers help drive demand for the organic/indG.A.P. certified products from the farmers so that they are encouraged to retain their "organic/indG.A.P. certified farm status and do not go back to traditional ways of using chemicals and pesticides indiscriminately to get only high production. Even those converted to organic farming may just grow enough organic produce for their family's consumption, if the consumers fail to recognize them. So, if we want to eat healthier produce, we must play our part in the entire exercise.

It's about time we discuss in each family our options on what to eat and where to buy from. The certified farmer knows how important to serve the consumers' nature-friendly produce. But do we know our farmer? You can choose either one. Grow your food, or identify certified farmers and pay for their farm produce better. The latter is the easier and better way to go as we believe in the collective responsibility of all stakeholders in the supply chain of Certified Organic/IndG.A.P. producers. Eat good, clean, and minimally processed food.

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# Dr. Prashant Sharma

Managing Director, Foodtech Consults India Pvt. Ltd,
Agra, Uttar Pradesh

**His interests include post-harvest management, value addition process, quality control and statutory compliances in food processing industries. In a recent talk, he discusses about Milk and milk products processing.**

Milk processing can help small farmers and at the house level also. Milk which is highly nutritious has a short shelf life. So handling and preserving it for a long time is cumbersome. Since it is an excellent medium for bacteria and pathogens, it gets spoilt easily and affects human health. Processing milk can help in preserving it for a long time and improved shelf life. Techniques such as chilling, cooling, heat treatment or pasteurisation or spray drying to get milk powder help in preserving milk for a long period. Pasteurisation helps in keeping pathogens and microorganisms to the level that they do not cause any health hazards. It can further be processed to valuable dairy products such as butter, cheese, ghee etc.

Milk processing involves stages such as collecting from farmers, storing it, separating cream, pasteurisation, homogenisation etc. Milk market in India is growing rapidly since 2015. Milk processing industry contributes significantly to Indian rural economy. Many FCMG players have started venturing into dairy segment to come up with new product and expand business that may help in development of fund raising for milk industry. Increasing urbanization, rising income, and retail outlets lead to increasing demand for processed milk products in India.

But milk processing in India is yet to achieve its full potential due to challenges like gaps in supply chain, insufficient cold storage and distribution facility. India is the largest producer of milk and dairy products in the world. There is a great improvement in per capita consumption of milk in the last few years. There is a huge demand for dairy products because of their low fat and cholesterol content, and many international players are producing nonconventional dairy products such

as yoghurt and probiotic drinks in India.

However, unorganised sector of farmers account for major share of country's dairy market. Domestic players are also focusing much on dairy products with packaging innovations to strengthening their market positions in the country. The commonly used milk products are ghee, butter, paneer, khoa, milk powder, and ice creams. Fermented milk products such as curd, butter, milk, lassi, and yoghurt are equally popular. Ghee is widely used in cooking, and pure butter with its fragrance and rich taste are the second largest consumed dairy products.

Ghee is famous for its deliciousness and is consumed as health food in the Indian subcontinent. It is also used in traditional medicine, for healing bones, improving digestion, and boosting immune system. But excess use of ghee may lead to cardiovascular problems. Butter is a dairy product obtained by churning of milk and can be used as spread. It is a very good source of protein and other saturated fats. Demand for spreadable butter is increasing in other countries.

Since very long time, farmers in India are rearing cattle as their secondary source of income. Now they have to plan on how to rear the cattle without diseases and give high yield of milk. Government is also trying to stimulate small collection centres at village levels where bulk milk from farmers and small quantities from households are collected and stored in hygienic and controlled atmospheric conditions. From these milk coolers, the chilled milk is transferred to the processing plants.

Milk processing plants can be of various types depending on the number of products the unit is trying to produce. Once the fresh milk is fed into the unit, it gets checked first at the milk receiving dock for its physical qualities, colour, smell, and taste of the milk. It is passed through a muslin silk cloth to a steel tank, and samples are taken for immediate testing to test the quality or MBRT (methylene blue reductase test).

If the colour changes slowly, its quality

**Can you elaborate on the topic?**
Nowadays some units also produce functional foods such as yakult. It is a dairy fermented product, and it contains microbes which are gut-friendly and improves digestion. So industries are working in this field to produce such dairy products which have good health impact, work as general health tonic or medicine, and have pharmaceutical effect on the body. Companies are coming up with calcium fortified milk, curd, and probiotic enriched products also. You can also opt for such units where only fortified products are produced.

In India carbonated water drinks are used widely. It is time we change to dairy based drinks which are healthier than such carbonated drinks. Our clients such as Fresco, Gopalji, Milkam Foods have opted to manufacture different fortified milk and flavoured milk. We are also working on a dehydrated spicy dairy drink. We can produce a powder form for that and mix it to get the drink ready whenever we want.

**Is processing a2 milk viable?**
The demand for a2 milk is mostly in metro areas only. You have to do the research on the type of customers around your location to start the process.

**How is your company useful to dairy farmers?**
We have a sister concern training institution , Global Institute Of Vocational Education And Skill Development in Agra where we run short/long term courses for farmers and upcoming entrepreneurs where veterinary doctors and experts from dairy industry train on how they have to breed, feed animals, at what time, what to be fed, and what medicines to be given to increase the productivity and improve the quality.

**Will it be a viable project to export cow's milk or cream without any contamination to India from Uganda and get it processed to ghee to be sold in India?**
It appears to be a feasible project. You can send a synopsis, and I shall elaborate it.

**How much milk is needed to produce 1 kg ghee?**
The fat content varies from animal to animal. It can be decided by the fat content. Buffalos in UP are different from the Murrah buffalos. Jersey cows are different from desi cows. We can never say we can get 1 kg of ghee from a specific quantity of milk. Only after analysis of milk we can determine that.

**What other products can we get from cow's milk? What is the price of cow's ghee, unadulterated one in India?**
We can use the separator to get butter, cream, white butter, table butter and other products after separation. Ghee is the primary product from the dairy industry. The price of ghee from cow's milk ranges from Rs. 600 to 800, and buffalo's milk ghee from Rs. 500. If you plan to have a special cow milk unit in Uganda, you will get a number of importers from India for cow ghee. There may be some change in import duty for cream and ghee. You have to take care of it.

**About organic certified milk?**
We have started one micro unit in Agra for organic milk. We take the cow dung from a slaughterhouse and use its manure for growing the fodder for the animals. No chemicals are added. Milk is packed in 1 litre and 500 ml pet/glass bottles without any human touch. Delivery boys carry them to the society. It is kept at 4 degree centigrade, and it is an organic certified milk, and business is growing each day.

is good, and if it changes quickly it is considered a highly contaminated milk. Then the milk goes to the separator where the cream is separated, and it goes through pasteurisation process. The shelf life increases by this process, and the microflora is reduced to the significant level so that it cannot deteriorate the quality of the milk or processed products.

Then the cream separated from milk is sent to butter plant. Butter is processed at two levels – white butter or table butter, depending on the type of unit operating and the market. From the butter section, it is passed on to ghee section. The milk remaining after the cream separated is taken for further processing.

Many products such as skimmed milk powder. Secondly we can get cheese, third process curd, and if we are not going for the skimmed milk powder, we can further go for the casein production. It is widely used as edible and industrial casein depending on the quality of the product, temperature, and treatment. The remaining milk is used for processing whey protein concentrate. Further milk is processed to get lactose extraction where lactose a milk sugar with high demand in the pharmaceutical industry is processed.

Depending on the type of milk, full, slim, or ultra-slim milk is obtained and also skimmed milk powder. They can be taken to poly-pack section or flavoured milk section.

A large number of dairy units can be established depending on the type of products you want to process in the unit and the budget you want to invest in the plant. Government assistance and subsidy for the establishment of such units is available. According to ministry of food processing, any business entity or new start-up is planning to establish a milk and milk products processing unit, they can apply for the subsidy from government.

They can get 35% of the cost of the project for technical, plant, and machinery, and civil construction cost in the general and plain areas. 50% of the total cost is available in Northeast areas and island areas like Andaman and Nicobar. The subsidy is available for storage, collection centres, and for transportation in the cold chain.

Second option is when you opt only storage, collection and chilling centres, from where you have to transfer the chilled milk to the processing units, this style of the project fetches 30% of the total cost from the government which is non-refundable. The remaining part has to be met by the entrepreneur through his own contribution or from term loan from financial institutions.


When one opts for a plant which produces all the products, collects milk from the collection centres at the village levels, have storage, transportation, and processing of dairy products, with the help of internal chillers, freezers, cold storage, vents, and deep-freezers outlet distribution to the retail outlets, the government finances through the ministry of food processing industries up to 50% of the total cost in general areas, and 75% in Himalayan, Northeast areas, and island areas. The project includes the technical, civil, plant and machinery costs. The rest has to be financed by the entrepreneur or financial institutions.

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# Ashish Gupta

*Director - Marketing - Kanta Enterprises Pvt Ltd in Noida, Uttar Pradesh.*

**Leading manufacturers, suppliers, and wholesaler of a wide range of high quality natural essential oil, spice oil, and natural crude oil. In a recent interview he explains the various methods of natural oil extraction.**

Essential oils are not made but extracted from plant materials actually. Extractions are used to obtain essential oil from the plant material, and they are the main constituents of the plant that help us to keep fit. Rather than eating or having a plant directly, it is always better to take it in the form of essential oil which is helpful and reaches our body faster than other means.

There are 5 methods of extraction of essential oil – steam distillation, solvent extraction, water distillation, cold press extraction, and $CO_2$ extraction which is the latest technology being used worldwide for essential oil extraction.

**Steam Distillation**: This is the most popular and widely used method to extract essential oils globally. In this method water and plant are put in the tank, from the bottom, steam is passed. Once we start the steam, the temperature rises to the boiling point when the plant gets evaporated, with the help of steam goes to the condenser where we have the inlet of cold water, the material get condensed. The hot water is let out, and the material condenses and goes into a separating funnel. The oil floats on the top, and water stays at the bottom.

There is a large tank called Still made of stainless steel. It contains the plant material, steam injected, and the vaporised compound travel to the condenser. There are separate pipes to make the hot water exit, and cold water stays at the top. Aromatic oil drops from the condenser are collected in the separator. Some essential oils are heavier than the water, and in such cases it settles at the below the water, for example clove oil. First we have to remove the oil and then water.

**Solvent Extraction**: This is usually used to make extracts for products that have minimum quantity of essential oils. We get an herbal extract, a thick paste of liquid when we use this method. In this we take the help of solvent like Hexane, ethanol, etc to extract the oil from the plant. The herbal extract is produced when botanical material is introduced to a solvent in which plant material get dissolved. Ultimately the solvent becomes infused with the botanical material that it has pulled from the source plant. This is what is referred to as extract.

The solution remaining at the end can be liquid or solid called as the wax portion of the oil. The method of extraction is we use hexane or ethanol to make essential oil from the plants. This method is best suited for plants that have low essential oil content. For getting finer fragrances, this method is used. Once the plant material is treated with solvent material, it produces a waxy, aromatic compound called concrete. Jasmine, Lotus, Tuberose, Rajanigandha, and Sambac are the flowers extracted using the solvent extraction method as they have less essential oil.

First concrete is made, then it is mixed with alcohol, and the oil portion is released with the waxy portion settling at the bottom. This method is used in all expensive materials worldwide. We use a vacuum distillation in the process to remove alcohol from the plant. Once it is done, the material goes to the condenser and then absolute. When the vapour gets condensed, we collect the absolute in a different portion. There are 2 portions in a tank. We can get the waxy portion at the bottom, and the oil is removed.

**Water distillation**: Basically this is done for some dedicated flowers such as rose, kewra, because if we pass the product through steam, it becomes a lump, and no oil will be obtained. Water distillation is done for those products that do not need

Solvent Extraction Unit

much heat. The boiling point of the particles' molecules in the rose is at low temperature. We use water distillation in this case. It is similar to the steam distillation process. We do not pass steam, we put hot water, boil the water from the fire near it, and the material gets condens2ed and collected like in the steam distillation method. It is the most effective method of extraction in situations where there are fragile plants. The water protects the extracted oil from overheating so that the plant material does not become lumps. Nowadays lots of trends are happening for hydrosol or flower water. So in this case, when we separate water and oil, the water left out is called herbal water, hydrosol, or floral water, essential oil water etc. This also has medicinal property, and we can sell it in big quantity, and there is a huge demand for this.

**Cold Process Extraction**: This method is also called expression method and is used for citrus peels in particular. It is not much used in India because there are not much citrus fruits available. This method is mainly used in Italy and Brazil to extract oil from lemon, orange, mandarin, and bergamot.

The whole fruit is placed in a device that mechanically pierces to put a hole. The essential oil sacs are located underside of the rind, and the essential pigments run down. When we get the oil, it gets mixed up with the juice. We separate the juice and oil through filtration process, and we get both products separately. It is this juice which is sold in tetra pack in markets.

**CO2 Extraction** : This is the latest and the best technology, though it is not yet popular in India. But in the future, this is going to be one of the main sources of essential oil extraction, and people will demand for this. This is the supercritical extraction process of herbs, very similar to producing oil through distillation. It is used in aroma therapy and natural perfumery. You will be wondering it is $CO_2$, and how safe it is to use. $CO_2$ is what we exhale out which is required by plants to grow. So it is a safe thing. When we do the process of distillation the $CO_2$ gets removed from the plant. The oil which is extracted through $CO_2$ method is thicker than the one from distillation method because we get all the components in it which we do not get from steam distillation. It is a better way to get oil. It is an expensive process than steam distillation.

Pressurised $CO_2$ in a liquid form is mixed with the plant material. When we put the plant material with liquid $CO_2$ in the tank, it makes it become pigment and resin. After some time the essential oil content starts dissolving in the liquid $CO_2$. The plant releases the resin and other things, and the essential oil starts forming. The $CO_2$ is brought back to the natural pressure.

$CO_2$ process is faster than steam distillation method. It takes less time to get oil than steam distillation which takes more than 24 to 48 hours, while $CO_2$ distillation takes 8 to 12 hours. We collect the material in the funnel where we have the separator. We get the oil and from here when we reduce the pressure of the material we get, $CO_2$ becomes a liquid gaseous form, goes to the $CO_2$ tank. We will get the oil in the separator.

**Difference between steam distillation and CO2 distillation**: The oil derived from steam distillation varies due to factors such as temperature, time of process, and pressure of steam we apply on the plant. We get different qualities of oil through steam distillation. In case of $CO_2$ distillation, we may produce high quality oil, and there is no difference of grades. So this is one of the advantages of $CO_2$ extraction method.

The difference between traditional distillation method and supercritical extraction is we reuse the heated steam to distil the oil. In this we use $CO_2$ where the temperature of the complete process should not go beyond 100 deg c. But in the case of other distillation methods, the temperature goes beyond 140 to 200 deg c. So this is also a safer method because there is not much heat or products involved to generate heat. Molecular composition of plant matter and essential oil changes due to temperature. $CO_2$ extracted oil is thicker than oil obtained from other methods of extraction. The $CO_2$ extract contains more plant constituents than steam extraction process because we are using low temperature in steam distillation method, but it is not necessary that we get all components of the plant which is not the case with $CO_2$ extraction.

**How CO2 oil is different from steam distilled oil**: When we distil oil through $CO_2$, for example chamomile flower, we get a green colour extract. But when we do the same with steam distillation, we get a bluish colour of the material. We know that the flower is greenish in colour, and the oil obtained by $CO_2$ method retains the colour. During steam distillation, the colour changes.

The most popular essential oils are

GCMS Machine

lemongrass, citronella, palmarosa, eucalyptus, peppermint, basil, tulsi etc. These are the most consumed products. I would advise anyone who wants to start this business to go with these products because it is easy to sell them and get money. It is better to start safe.

**Which is the best way to extract curcumin from turmeric?**

Solvent extraction is used to distil curcumin. There are 2 methods involved. Initially you can extract the essential oil through steam distillation. From the left over material, you can extract curcumin sold in the market. Both methods of solvent and steam extraction can be used to get curcumin.

**Which is more economical – lemongrass or palmarosa? How long it will take to get fresh lemongrass to take for distillation? Is it possible to cut and take it to the plant? How long will the freshness stay?**

You can expect 3 cuts of lemongrass in the first year for extraction. You can get 4 cuts from the second year. If the extraction plant is within 100 kms, freshness will be there.

**How do we gauge the market fluctuation? What is the economics of lemongrass and palmarosa?**

I suggest you to see what is the minimum selling price for the oil. Do not consider a high price which was there a year back. Consider only the lowest minimum price, do the calculation, and invest. Do not incur loss just because it was sold at a higher price. New farmers invest, and when the price goes down, they get demotivated and exit the business. Whatever extra you get is your profit. Never think you will keep getting the same high price every year.

In one acre, from one cut, you will get 30 to 40 kg of oil in one single distillation. It depends on the area and the plant you have used. You will get 90 kg in a year, and more in the next years. You can cut the grass for at least 3 years. You will get Rs. 1050 minimum definitely, which depends on demand and supply. It may go up to Rs. 2000 also. Between lemongrass and palmarosa, lemongrass is more stable. Palmarosa oil price keeps fluctuating.

**Can you please tell me what is the optimum temperature at which the essential oil from the plant material will come out?**

It depends on the plants. Each plant has a different boiling point. Minimum temperature at which we may get oil is 90 degrees to 100 degrees and it goes upto 200 degrees.

**When we cultivate geranium, can we plan CO2 extraction method for this plant?**

Yes. You can. In $CO_2$ extraction, the disadvantage is the initial cost to set up the plant is high. But later on it becomes easy and more cost effective to extract oil. When we extract oil from $CO_2$ and steam distillation, the cost of steam distillation is less.

**What is the protocol for exporting the essential oil?**

There is no protocol, you have to apply for import export code. You can start exporting the oil if you have customers who want to buy it. No certification is needed except certificate of analysis and material safety data sheet to export.

**What is the difference between normal steam distillation and the process used in India where they keep fire under the vessel?**

Farmers of smaller areas follow the method. When we use proper boiler and steam, we get a pressure valve, through which we pass similar or constant temperature steam. In the other method we have no control over the pressure or steam and we may overheat or pass more steam. Then the main components get evaporated, and the quality is inferior. It is always better to use an automated system or better technology with steady temperature and steam.

**What is the difference between MS and SS vessel with respect to quality?**

MS is not recommended by the industry. It is always better to use stainless steel which has food grade and higher boiling point. When we use MS, they also release iron component at high temperature due to which the quality of oil and colour get affected. When we use steel tanks, it gets better quality and colour of the oil. When we do it in MS, it is blackish and no shine on the oil. MS product is considered inferior in terms of smell, colour, and property.

**How much CO2 is consumed in supercritical method to top up every time?**

Not much. It is cheaper to distil oil using $CO_2$ than steam extraction. $CO_2$ gets collected in the liquid form again. We are not refilling $CO_2$, and it gets circulated back in the tank.

**In case of lemongrass processing, CIMAP says that in one hour 90% of the oil is extracted. If so, can we stop the process in one hour and do more batches? Does it affect the quality?**

90% of the oil maybe extracted, but it will not have all components. To get good quality oil, you need all the components. Majorly, the Citral Content In

India which is 70 plus. Earlier it was 75. With climatic change, it has come down. So minimum 70% Citral should be there along with a few more components to have good quality oil.

**What is the minimum area of cultivation for CO2 plant establishment?**

It is up to you. It could be any measure of land. Plant should have that much capacity to extract oil. It is an expensive technology, but in future it will come down.

**To get breakeven on an investment of Rs. 25 lakhs, what is the minimum quantity we should have to work on?**

It depends on what product you extract using CO2. For coffee extraction, cardamom oil, black pepper, CO2 extraction is used. No one has done test or trial with lemongrass or peppermint. It is not viable in that.

**Do you do contract farming?**

Yes, we do. We do not have any collection point in South. We can buy the oil from you.

**What is the minimum area we need to put up a distillation plant? What is the cost?**

For distillation unit, you do not need big area. You need less than half an acre, about 1000 to 2000 sq ft. Not much. It also depends on the size your plant or size of the tank. Government subsidy is available. You can try that. The starting price is about Rs. 5 lakhs.

**How much does it cost for curcumin extraction from turmeric? Does turmeric oil have good demand?**

It has good demand in the market. There are two types of curcumin oil – leaf oil and root oil. Leaf oil costs Rs. 700 to 750 while the root oil costs Rs. 1050.

**What is the market for blue lotus concrete and absolute? Plant cost?**

It is a niche market, but good. it is an expensive product. It is not available in India but in Sri Lanka. It is about Rs. 500 to 1000 per kg. It is used by companies that produce fine fragrance in Europe. The pink lotus absolute is Rs. 3 lakh to 3.50 lakh per kg. For blue lotus I am not sure. Solvent extraction plant for 1 to 2 MT raw material costs about Rs. 30 to 40 lakhs.

**What is the best method for mustard oil extraction?**

Solvent extraction is best method for mustard oil till now. It is a low cost product. You cannot go for CO2 method as the technology is expensive.

**Can we grow lemongrass under shaded condition, under coffee?**

Not sure. It may grow, but it will not give what it should. I feel lemongrass should be grown separately.

**Since oil extraction is lucrative, who do you think can start this venture?**

If you have spare land, not used, you can get side income by starting this business. There are people in agriculture business, not getting enough money growing plants or food. They can get into aromatic plant cultivation and essential oil extraction.

**I have a dry land of 15 acres. Can I grow lemongrass with minimum water facility?**

No, lemongrass needs more water.

**Can all the different processes be set up in one plant to extract oil?**

Yes, it can be set up at one place, but then you would require a large space for the same.

**Can you think of any reason why lots of KachiGhanis coming up in cities? Is there any gap that people want to meet with regard to oil?**

Kachi Ghani is a food oil is being used all over india. Palm oil has been banned by the government due to the health issues it creates. There is a huge demand for sunflower and castor oil globally. That could be the reason for expanding the business.

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# K. Karthik

**Managing Director, Suma Agro India Pvt Ltd, Chennai**

**The company, started in 2013, is working on changing the farming to benefit one and all. His interests are soil and sustainable agriculture. In an interview, Mr Karthik talks about how to use quality agri inputs for healthy soil and healthy plants.**

Suma Agro India P Ltd is the first company in India to manufacture Humic acid in the form of Potassium humate. The Company has been manufacturing high quality Humates since 2013. Our philosophy is based around sustainable agriculture with an emphasis on optimizing the physical, chemical and biological actions of soils. Humates are now recognized as the single most productive input in Agriculture. Our state of art manufacturing plant is located near Chennai with installed capacity of 1.2 million litters a year.

The science of Agriculture is based on nature. Along with air to breath and water to drink, soil is one of our most important natural resources. Soil isn't just important because it is the source of our food, it also plays a vital role in regulating the climate, providing clean drinking water and supporting plant and animal biodiversity. But over exploitation of vegetation and soil resources, together with inappropriate farming systems has resulted in land degradation, soil erosion, nutrient depletion and accelerated soil acidification, salinisation and desertification. Today our farmers face new questions everyday as farming becomes more difficult.

Farmers thought most of the problems in farming can be dealt with external inputs. They react after seeing a problem.

If the soil is nutrient deficient – Apply fertilizers

If the soil is compacted - Use implements

If the soil does not store water – Irrigate

If there is a pest attack - Apply pesticide

All the above problems are interrelated and symptoms of a deeper underlying problem called SOIL FERTILITY. Soil plays vital role in the earth eco system. Without soil fertility, management of sustainable agriculture is impossible. Soil fertility is the foundation of sustainable agriculture.

The significant role of soil in food production is widely recognized, but the contribution of soil to food security and nutrition are relatively less considered. Feeding an ever growing population is a major challenge. With our Active Carbon Technology (ACT) products, now it's time for a new revolution in Agriculture – A Brown Revolution to rejunuvate our soil and feed our generations to come and to make Agriculture truly sustainable.

With 37% Indian land degraded and declared not fit to do agriculture, as the soil is unable to hold micronutrients, we have to understand the nutrition density. We have to focus on growing healthy plants and food. When efficiency of nutrition comes down, soil is unable to convert more nutrients to the plants, and we pour more nutrients to fill the health and use more fertilisers. To make agriculture sustainable, soil is the key.

Sowing the seeds of change – we feel soil organic carbon is the key to indicate fertility and parameter to measure soil health. Soil organic carbon is the key to all the processes and properties and nutrient recycling in farming. Suma Agro extracts the carbon from lignite with unique Active carbon Technology The technology is nontoxic to environment, materials are carbon efficient, and proven one. We have sold more than 20 lakh litres of our product in India alone.

Humicas is our flagship product. It is the changing factor on soil organic carbon. It increases the yield upto 40%. The result of less chemical fertilisers and more nutrients uptake can be seen in the yields of the crops.

Impacts of climatic change – how climate change affects agriculture is diffi-

cult to decipher. When climate changes such as rise in temperature, the yield in maize comes down by 12%, rice 23%, wheat 13%, and other products by 8% leading to price rise with growth of population. Farmers think that they can handle farming by dealing with external input and take action if they see problems.

When each government wants to bring in green revolution 2, we protest that we do not need it. We need a brown revolution 1 to rejuvenate our soils to feed generations to come. It can solve any problem faced by the farmers. UK government has declared that they will not pay subsidy unless soil health is improved. Most of the European countries penalises the farmers who use more fertilisers. The same system should be followed in India and we request our Government to provide more programmes and awareness to increase soil health.

Social and environment impact – when soil health improves, it can address water retention, climate change, nutrition density, and food security. We always feel build the soil, harvest plants, feed people, and heal the planet.

**What is the percentage of humicas to apply at various stages of crops?**

Humic acid and potassium humate are different. Humic acid is equated to organic manure and does not contain much of carbon. We take organic carbon as benchmark in our products. We extract this carbon from lignite or Leodarnite. Mostly these are imported from China which is not from a natural source. We tell our farmers that our product has more than 20% organic carbon. Irrespective of what crop, you have to use 20 to 30 litres of our product every year. The current level of organic carbon is 0.2 to 0.4% which his very low and farming becomes difficult. It has to be increased to 1 % at least. If we put more carbon into the soil, it will remain there and hold nutrients from leaching due to rain or excess water. When the soil is healthy, leaching does not happen. It retains water. The root development is key. We advise them to use more humates in the early stages of crop so that in case of any stress later, the plants can withstand.

**Which is more beneficial – foliar spray or solid?**

If it is potassium humate, and if it is natural sources, it can benefit in both the ways. We focus on organic carbon which is crucial to soil. During extraction process, it contains trace elements and potassium. So it is better as foliar. Both ways are beneficial to the plants.

**Under which brand are your products available?**

Our brand name is Humicas and Jeevan.

**Are you interested in distributors in Karnataka?**

Yes, we are.

**What is the cost of your product per acre for moringa? What is the dosage, and will there be increase in yield because of that? Should it be added every year?**

We recommend per dosage 2 litres of our product diluted in 100 litres of water per acre for moringa. We prefer applying it every month because once the soil health is increased, the need for fertiliser comes down, and the resistance for plants against diseases goes up. You will see increase in yield and decrease in usage of inputs. The expected increase in yield is about 35%. More than the yield, it is the good quality product and better prices the farmers get.

**How to improve the carbon content of the soil?**

You can do a basic soil test in any university or laboratory and ask for the soil organic carbon content level. You can fix the dosage accordingly. If it is low, you have to keep adding. If you put 20 to 30 l of carbon also, the soil will retain. If you can increase the soil organic carbon level by 1%, about 92,000 litres of water can be retained per hectare. The ideal form is liquid as it is the end use. You can spray it on the soil or drench or by drip irrigation. 1 litre of our product should be diluted in 50 litres of water.

**I have a red and loamy soil, and water flows down if there is rain. For banana stubble, I mulched to get carbon content to soil. For tuberose can I use mulching sheet? Will it have leaching effect?**

In any crop you grow, a healthy soil contributes by 60% and 40% by management. Leaching will not happen, and when you enrich the soil, it will find particles and hold nutrients at the root level. It finds all inputs for the next cycle. If organic carbon is not there, it will wash off. It acts as a catalyst.

**Tell us about fulvic acid.**

Fulvic acid is beneficial if used as a foliar application, and humates helps in soil application. Fulvic acid contains more oxygen. Dealers recommend this to be used along with pesticide. It gives a catalyst effect and buffering effect when you use heavy toxic substances. It neutralises the adverse effect. Potassium humate comes in as flakes and liquid form. Liquid form is better. Even if you buy flakes, one litre of my product can dilute 10 kg of flake.

**Do you have end users all over India? How is your distributorship going on?**

We sell on all ecommerce platforms like Amazon and Flipkart. We export to Africa and South East Asia.

Recently we received the "Transformational Social Enterprise of the Year" Award from Tie Sustainability Summit, Tie Hyderabad. We have also received "Best Social Enterprise Award "award from Action for India Summit in 2019.

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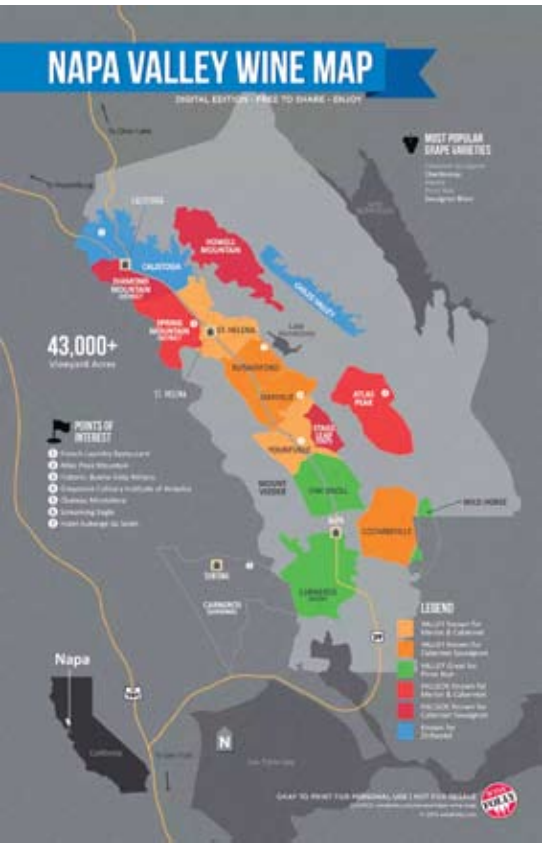
# Californian wineries turn to owls as answer for growing pest problem

- **Rodents like gophers and mice wreak havoc on vineyards, causing owners to make drastic decisions on how to control them.**
- **Rather than turning to rodenticides to deter pests, a new study is testing the effectiveness of owls to manage the problem.**
- **The researchers have surveyed 75 wineries in Napa Valley, and four-fifths now use the owl nest boxes and notice a difference in rodent control.**

Winemakers must pay close attention to their soil, the rain, the heat, and the sunlight. But rodents like gophers and mice can wreak havoc on a vineyard. Rather than turning to rodenticides to deter pests, graduate students at Humboldt State University in California are testing a more natural approach by using owls.

The experiment is part of a long-term research study under the direction of professor Matt Johnson of the university's Department of Wildlife. The current cohort, including students Laura Echávez, Samantha Chavez, and Jaime Carlino, has placed around 300 owl nest boxes sporadically through vineyards in Napa Valley. They are documenting the impact of relying on owls to deter and remove pests rather than rodenticides.




The researchers have surveyed 75 wineries in Napa Valley, and four-fifths now use the owl nest boxes and notice a difference in rodent control. The barn owls have a four-month nesting season, during which they spend about one-third of their time hunting in the fields. A family of barn owls may eat as many as 1,000 rodents during the nesting season or around 3,400 in a single year. So far, the graduate students have found that the barn owls in vineyards are reducing the number of gophers, but not mice. They are also evaluating the owls' impact on voles, but that is inconclusive at this time.

But the most important part of the study is whether or not the presence of these owls has led to a decrease in the use of rodenticides in Napa Valley. As of January 2021, the California Department of Pesticide Regulation placed tougher limits on rodenticide use, which can kill birds and other animals that eat rodents poisoned by the rodenticides. These pesticides lead to gruesome deaths via internal bleeding for the rodents that ingest them.

The researchers say that most of the vintners in their study no longer use the rodenticides since adding nest boxes to their properties. But whether relying on owls is reducing pesticide use in Napa Valley isn't certain. One recent study found that of farmers growing wine grapes in Napa Valley, about 80% use nest boxes and about 21% use rodenticides.

"Whether the use of barn owl boxes caused that reduction in rodenticides is, of course, not proven," Johnson told Bay Nature. "Nonetheless, this result is encouraging."

Farmers have been using owls and other raptors to hunt rodents for centuries, but modern chemical pesticides have taken precedence over natural methods in recent times. In an effort to leave less of a negative impact on the environment, farmers around the world are reverting back to relying on raptors to control pests, rather than toxic pesticides. Nest boxes are popping up in agricultural fields across the U.S., Malaysia, Kenya and Israel to help naturally remove rodents that destroy crops.

In Napa Valley, nest boxes aren't the only tactic for creating more sustainable farmland. Wine grape growers are also trying to minimize water usage and tilling. They're also planting perennial grasses between rows of grapes, as this may reduce soil erosion and improve nutrient and carbon cycling. Still, there's a long way to go in improving sustainable agriculture, including in the wine industry. Napa Valley has over 40,000 acres of vineyards, and only 3,800 acres are certified organic. With the increasing use of nest boxes, there's hope that farmers will rely on these more natural methods over the rodenticides.

Written by
Paige Bennett, Writer, EcoWatch
Source : World Economic Forum

# Agri-tech digital tools boost crops for farmers across Africa

- **New technology in African agriculture can make smallholders' jobs much easier.**
- **Apps that connect you with tractor owners, weather alerts and sellers have taken agriculture by storm.**
- **Smallholder farmers contribute to more than one third of the world's food, so innovation is extremely important.**
- **Access issues remain, particularly for women.**

Until a year ago, it would take Pamela Auma a whole month to prepare the land on her farm in western Kenya for planting ahead of the rainy season.

With hoe in hand, the mother-of-seven spent her days digging up the one-acre (0.4-hectare) plot - roughly the size of a football field - and praying she would finish in time to sow her maize and beans crops before the rains arrived.

These days, the same job takes her less than two hours, with the help of a tractor she hired through Hello Tractor, a Kenya-based smartphone app that connects small-scale farmers with nearby tractor owners.

"The tractor is much better than doing it by hand. It gives a quality job and works very fast," said Auma, 52, by phone from her farm near the city of Kisumu. "Before it was hard to find a tractor to hire and it was very costly. Now, the booking agent can quickly find a tractor owner near me by using his phone."

Across Africa, a growing number of smallholder farmers are tapping into digital technologies to access information, services and products to improve efficiency, boost crop yields and increase incomes. From Nigeria to Ghana to Kenya, a slew of innovations in agricultural technology - or agri-tech - have emerged over the last decade to serve small farmers, who have long been neglected yet are crucial to the continent's food security.

These range from SMS weather alerts and mobile apps offering credit, seeds and machinery to more advanced solutions such as precision farming, which uses satellite, drone imagery and soil sensors to provide real-time data on crop health. Aloysius Uche Ordu, director of the Africa Growth Initiative at the Brookings Institution, a Washington think-tank, said this digitalisation of farming has the potential to transform the sector.

"Africa is the world's breadbasket – or should be. It has vast arable land, grows a wide variety of crops and has vast irrigation potential with seven major rivers," said Ordu. "Yet, Africa imported $43 billion worth of food items in 2019. Digital technologies ... are eliminating the traditional inefficiencies of smallholder food production and helping to close the yield gap."

## Rush to feed the world

More than 80% of the world's 600 million farming households are smallholders who own less than two hectares of land, says the United Nations' Food and Agriculture Organization (FAO).

Taking up 12% of arable land globally, these small growers produce more than one-third of the world's food. But smallholder farmers across the region face a plethora of challenges. Farm work is labour intensive and time-consuming. Most farmers face limited market reach, have little information to improve their output, and cannot access credit or insurance to help them get hold of quality agricultural services and inputs such as seeds, fertilisers and machinery.

On top of that, increasingly erratic weather attributed to climate change is hitting crop yields and COVID-19 lockdowns have stifled their ability to access supplies and sell their produce. But while many farmers struggle to grow enough to make a living, the world needs more food, fast.

The World Resources Institute predicts the global population will reach close to 10 billion by 2050, and to feed that number of people, food production will need to grow by nearly 60%.

## 'Uber for tractors'

Digital technologies are key to making sure the world has enough to eat, say agri-tech innovators. Taking advantage of Africa's fast-growing network of mo-

bile phone users, there are now more than 400 digital agricultural solutions in use across sub-Saharan Africa, according to a 2020 report by global telecoms industry lobby GSMA.

Hello Tractor, the app Auma uses to help with her farm work, operates in 13 countries including Nigeria, Kenya and Tanzania and is often described as an "Uber for tractors".

The app lets tractor owners rent their machines to smallholders in their area and allows farmers to pool together to rent a vehicle at affordable rates.

The tractors are fitted with GPS devices so owners can monitor their location and activity.

"Mechanisation is so important to be a productive farmer. But, small farmers have labour and time constraints where they have a very short window to plant and if they don't plant on time, they lose yield," said Hello Tractor's CEO Jehiel Oliver. "So this technology is a way to get this expensive equipment to farmers."

Since launching in 2014, the company has served about half a million farmers, said Oliver, adding that 55% of the app's customers were using a tractor for the first time. There are also apps, like DigiFarm in Kenya, which act as one-stop shops that let farmers bypass middlemen to access low-cost seed and fertilisers, loans and insurance providers, and bulk purchasers.

In Ghana, Farmerline - a voice services and SMS platform - provides farming advice, weather forecasts, market prices and financial tips to about 1 million small growers. Moses Dery Sekyere, 41, who grows beans, maize and millet on a 10-acre farm in southern Ghana's Ashani region, said he subscribed to Farmerline in September.

"The information shared with me about harvesting techniques and post-harvest storage has been really beneficial to me this planting season," he said in emailed comments. "Now I know how to better handle my produce after harvesting them."

PlantVillage Nuru app can scan a diseased plant and give advice on how to treat it, while more hi-tech solutions like Nigerian start-up Zenvus use sensors to analyse soil data such as temperature and nutrients so farmers know what fertiliser to apply and when to irrigate.

## Digital divide

Korie Betty Maru, founder of Digital Farmers Kenya, a Facebook group with more than 436,000 members that shares advice and farming technologies, said small-scale farmers are eager to adopt technology and modern ways of farming.

"Be it finding new buyers for their produce, seeking advice from agronomists on fighting pests, or trying out more efficient products such as solar pumps for irrigation," she said.

Yet despite their abundance, many digital solutions struggle to scale and fail to improve the lives of farmers, researchers have found.

A study by Netherlands-based Technical Centre for Agricultural and Rural Co-operation (CTA) shows more than 33 million smallholder farmers in Africa have registered for some form of digital service, but less than a third use them enough to feel the full benefits.

Internet access is also still out of reach for most small growers in sub-Saharan Africa, where penetration rates are about 26%, says the GSMA. And women farmers are being left out due to the digital divide - the GSMA reports women in sub-Saharan Africa are 13% less likely than men to own a mobile phone.

In a region where 40–50% of smallholder farmers are women, only a quarter are registered users of digital services, according to the CTA.

Researchers say major investments need to be made in building information and communication technology (ICT) infrastructure and improving digital literacy in rural areas.

Elias Nure, who heads the digital climate-smart agriculture team at the charity Mercy Corps' AgriFin initiative, which provides specialised digital solutions to farmers, said one of the biggest challenges is adapting these tools.

"Some of these solutions are unbelievable, such as precision agriculture tools, remote sensing tools, blockchain tools and artificial intelligence," said Nure. "But, a lot of them are not developed for African farmers and may not be 100% tailored for smallholders."

Written by

Nita Bhalla, Journalist,

Thomson Reuters Foundation

Source : World Economic Forum

# Where can you find the world's most sustainable coffee?

## In a lab in Finland, of course...

Coffee – it's likely an integral part of your daily routine. Indeed, 25 million people depend on it for their well-being while, globally, we get through 600 billion cups of coffee each year, according to the Sustainable Coffee Challenge. But it's also a globally traded commodity and a multi-billion-dollar industry that's facing sustainability issues on a grand scale.

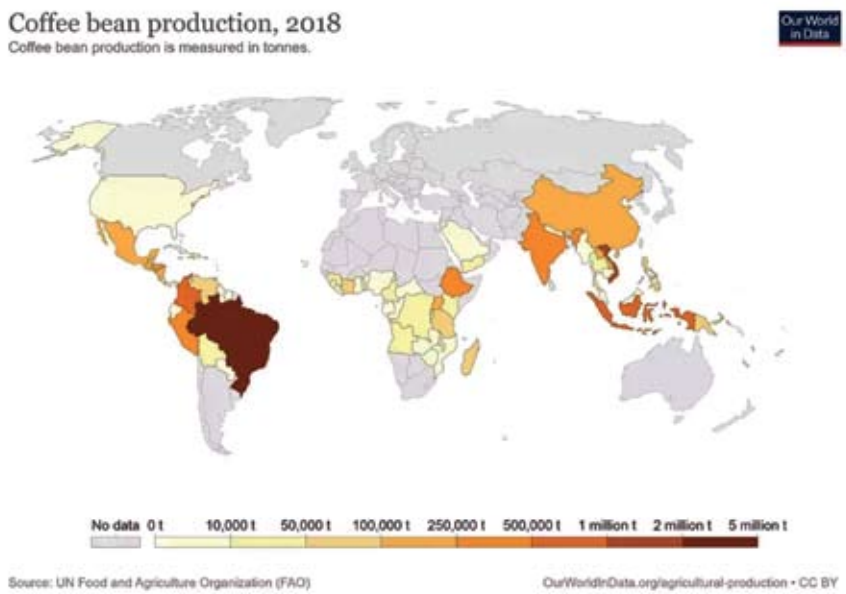
Challenges include water pollution, biodiversity loss, soil erosion, agrochemical use, deforestation, waste generation and labour exploitation, according to research published in Business Strategy and the Environment.

Since coffee is typically cultivated in tropical or subtropical areas, plantations often sit side by side with some of the world's most delicate ecosystems – raising the risk of potential damage to the environment. With that in mind, scientists are asking a new question: would you buy and drink coffee that's been grown in a lab rather than on a plantation?

### Coffee from cells

The VTT Technical Research Centre of Finland uses cellular agriculture to create coffee cells – a process that they say could be scaled up in the future. The first batches produced by a laboratory in Finland smell and taste like conventional coffee, according to the company, although "not 100%" admits a researcher. "We skip the farming part and we use plant cell cultures instead," Dr Heiko Rischer, Research Team Leader at VTT told Reuters in an interview. "So actually real coffee cell cultures, but they're not generated in the field ... instead we're growing them in bioreactors." Finding an alternative matters because coffee is big business – and growing: global demand is expected to triple production by 2050, according to a report from Conservation International. Rischer says getting regulatory approval and being ready to ramp up production could be just four years away. The research centre would also need to think about processing, product formulation and preparing the market for its new product.

- We drink more than 600 billion cups of coffee a year.
- But the industry is facing sustainability challenges including water pollution, biodiversity loss and deforestation.
- Now a lab in Finland says it can grow coffee using cellular agriculture, and other companies in the US are exploring similar concepts.




The result could mean your morning coffee has less of an environmental footprint. "Climate change is front and centre for the coffee industry," Rischer says. "We're seeing, throughout the tropical coffee belt, farmers being impacted by climate change, increasing temperatures, but also more erratic rainfall and increased drought."

### Coffee without beans

Other groups are also exploring the possibility of coffee without beans. US-based Compound Foods has raised $4.5 million in seed funding, giving it total funding of $5.3 million to pursue its aim of using synthetic biology to create

coffee by extracting molecules. Seattle-based Atomo Coffee aims to "hack the coffee bean" and create a molecular coffee.

And elsewhere, cellular agriculture is being seen as one of the key routes towards more sustainable food production – for example in the production of meat-free burgers.

These products – created using cell cultures rather than actual animals or plants – involve using far less energy and water, and generate much fewer carbon emissions. Even so, there's probably some work to be done convincing people to give up their daily brew – and the cultivation of coffee is an important source of income for much of the developing world.

There's also a human angle. Coffee is grown on 12.5 million farms around the world and up to 80% of those are smallholder farms located in developing countries, according to a report from the International Institute for Sustainable Development.

## Livelihoods at risk

Lab-grown coffee on a grand scale risks the livelihoods of workers in the coffee industry, Daniele Giovannucci, president and co-founder of the Committee on Sustainability Assessment, told The Guardian. More broadly, there is a need for common coffee sustainability indicators consistent with the UN Sustainable Development Goals, as well as a mandatory reporting framework, according to research led by Simon L Bager for the Earth and Life Institute.

Read full article @
https://bit.ly/3BteRIU

Source : World Economic Forum



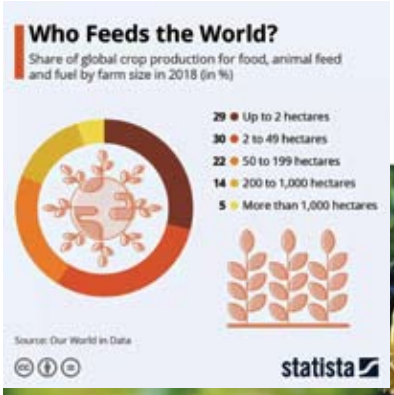
# The world's smallest farms feed more people than you might think, research shows

- **81% of global crops are grown on farms less than 199 hectares.**
- **China leads the world production of rice, wheat and many vegetables and operates mainly small farms, to supply its own growing population**
- **Big farms have a minority share in crop production, only contributing to 5% of worldwide crop growth.**

84 percent of a total of estimated 570 million farms worldwide were cultivating less than two hectares of agricultural land in 2018. Due to the low labor productivity and grueling work conditions on small farms, their yield stands in stark contrast to their total numbers: Only 29 percent of the global production of crops for food, animal feed and fuel come from land cultivated by smallholders according to Our World in Data. As our chart shows, most of the crops still are generated on farms smaller than 200 hectares or 500 acres though.

Roughly 81 percent of all food, feed and fuel crops were grown on farms of up to 199 hectares. Taking into account the average farm sizes of the biggest crop producing countries in the world, this number becomes less surprising. China leads the world production of rice, wheat and many vegetables and operates mainly small farms, often smaller than half a hectare, to supply its own growing population. The roughly two million farms in the U.S., which is the biggest producer of maize, soybeans and almonds, have an average size of 444 acres or 180 hectares on the other hand.

Only five percent of the total amount of crops are grown on big farms larger than 1,000 hectares like the family farm of world-leading almond and pistachio producers Stewart and Lynda Resnick with roughly 77,000 hectares or 190,000 acres. This divide also shows a discrepancy in terminology: The term "family farms" is often used to describe smallholdings, while in reality, it can be any farm owned by one individual or a group of individuals where the labor is mainly supplied by the family.




Written by Florian Zandt

Source : World Economic Forum

# The ocean is a $100tln market opportunity

**Tony Chen is co-founder and CEO of Manolin, a software and data analytics company that builds disease-detection models for aquaculture, based in Denver, Colorado.**

Investment in space companies reached a record $8.9 billion in 2020, and Virgin Galactic made history with the first space tourism flight this summer. Previously dominated by research and government agencies, the space industry has been propelled by private interests in recent years. Now, many are approaching the ocean with a similar lens – and the return on investment goes far beyond business.

"The ocean is a $100 trillion market opportunity," says Adam Draper, managing director at BoostVC and a seed investor in Coinbase. "This is the largest untapped investment opportunity in my lifetime."

The ocean sits at the center of the climate crisis. It's absorbing one-third of the human population's carbon emissions and is heating faster than scientists had predicted, according to a 2019 study published in Science. But protecting the ocean isn't simply a moral obligation to our planet; the ocean will play an increasingly critical role in global food security.

More than 3 billion humans depend on marine sustenance for their livelihoods. However, 90% of marine fish stocks are now fully exploited, overexploited, or depleted. Ocean aquaculture fills this critical gap in supply and demand. It already provides the majority (52%) of the world's fish for human consumption.

Still, ocean technology comprises a fraction of the booming agrifood-tech sector, which saw an increase in investment deals by as much as 34.5% year-over-year in 2020. In terms of innovation, this is a massive blind spot.

"The first World Oceans Day was more than two decades after we first celebrated Earth Day. Everyone touches land, but not everybody is physically connected to the ocean," says Amy Novogratz, co-founder and managing partner at Netherlands-based Aqua-Spark, the first and largest investment fund focused on sustainable aquaculture.

Farm-raised fish are some of the most resource-efficient animal proteins available, requiring relatively little energy and few inputs to grow. They're also some of the most-tracked food products. For example, the health status of Norway's 400 million active farmed fish is publicly available in real-time, as well as any farm treatments or disease outbreaks.

Predictive technology transformed critical services throughout the Covid-19 pandemic; and now, the same can be done for our food systems. Millions of satellites and sensors have already collected ocean and environmental data spanning decades. As the climate crisis continues to disrupt global supply chains, this data can be used to build healthier, more resilient aquaculture farms.

"Because there has been little innovation in ocean tech until now, the vast impact you can make with ocean tech is making it a very attractive opportunity," Novogratz says.

Leaders can look to Norway as an example. What Norwegian salmon farmers have done in the past 30 years represents some of the largest advancements in food production. The industry has enabled a 99% reduction in antibiotic use since the late 1980s by closely monitoring and regulating its ocean impact.

Norway is smaller than the state of California, yet it produces half of the world's salmon. Ocean sustainability is a top national concern. Seafood entrepreneurship there is heavily supported by organizations like state-owned Innovation Norway, the NCE Seafood Innovation Cluster representing more than 90 industry partners, and Hatch, the world's first aquaculture accelerator. The country is home to the world capital of aquaculture innovation, Bergen, and some of the most sustainable aquaculture farms globally.

Private interests around the world are tuning into the opportunity for ocean innovation. US agrifoodtech investor S2G Ventures made commitments of up to $100 million in oceans and seafood investment in 2020. This year, the European Institute of Innovation and Technology, funded by the EU, announced new projects to accelerate innovation in sustainable aquaculture. Meanwhile, food giants like Cargill, Chevron, and Google parent Alphabet have all made sustainable aquaculture investments of their own.

By Tony Chen

Image credit: katatonia82 / iStock

Read full article @ https://bit.ly/3w2IXBZ

Source : agfundernews.com

# Farmer marketplace DeHaat scores $115m in India's biggest-ever agtech round

Singapore sovereign fund Temasek participated as a new investor, with existing backers including RTP Global, Sequoia Capital, Naspers-affiliated Prosus Ventures, and Dutch development bank FMO also taking part.

The nine-figure haul is the largest on record for an Indian agtech startup, according to AgFunder data.

"DeHaat is bringing substantial value-add to the farming community in India. The uniqueness of its full-stack approach, combined with the 'phygital' go-to-market strategy, further reaffirmed our view that the company is on track to become a significant player," Sofina principal Yana Kachurina said in a statement.

Lightrock India partner Vaidhehi Ravindran said that her firm was "impressed with [DeHaat's] steep growth trajectory combined with a strong network of micro-entrepreneurs."

"Through innovative social engineering and tech-led execution, DeHaat has built the largest first-mile network for farmers and is well positioned to help transform agriculture by improving yields and farmer income," she added.

Patna-based DeHaat describes itself as a "full-stack agritech platform," linking smallholder farmers across India with input vendors, agronomists, distributors, financing options, and other service providers. More than 850 of these "unique agribusiness entities" are active on the platform, it says.

The startup has also recruited over 3,000 'micro-entrepreneurs' to serve as a first-and-last-mile rural logistics network, providing both delivery of inputs and other products to farmers as well as collection of their produce for delivery onwards to distributors and other offtakers.

"We at DeHaat are on a mission to build the world's largest agritech platform," Shashank Kumar, co-founder and CEO, said in a statement.

"Our team has grown to a brigade of 850-plus professionals with deep expertise in growth strategy, supply chain, technology, and agricultural science. The last seven months have been phenomenal, with 5x growth for DeHaat."

Until now, the startup's presence has largely been focused on India's north-eastern states — where it serves close to 650,000 farmers — but it plans to expand its reach in other parts of the country.

"We are now well poised to replicate that success in all major agriculture clusters of India in the next 12 to 15 months," Kumar said.

**Ag marketplace DeHaat has raised $115 million in Series D funding, it announced today. The round was co-led by Belgium's Sofina and Indian branch of the UK's Lightrock.**

DeHaat has raised a total of $157 million from "marquee" investors over the last 30 months, he added.

In January, it closed its Series C round, raising $30 million from investors including Prosus, AgFunder, and Omnivore (the latter has "partially exited" the company as a result of the Series D round, alongside earlier investor Pi Capital, according to a statement.)

The startup raised $12 million for its March 2020 Series B round.

In February this year, it acquired spatial imagery and data science startup FarmGuide to further bolster its marketplace and advisory services. That was DeHaat's second strategic acquisition since it launched in 2012, following its 2019 takeover of inputs marketplace VezaMart.

By Jack Ellis
Jack is Deputy Editor of AFN and Asia-Pacific Media & Research Lead for AgFunder, based in Singapore.

Source : agfundernews.com

# UAE indoor farmer Pure Harvest nets $65m to fund Asia expansion

The UAE's Pure Harvest Smart Farms has raised $64.5 million in a funding round led by South Korean investment manager IMM. A number of "existing investors and insiders" also took part in the fundraise, according to a company statement. At the same time, Pure Harvest announced the formation of a joint venture with PlanTFarm, a South Korean provider of tech solutions to the vertical farming industry that has also received investment from IMM.

"This is a landmark financing for Pure Harvest two reasons: first, IMM is one of Asia's most respected and successful alternative investors, signaling the strength of our investment case; and second, the firm has been a longstanding investor in controlled-environment agriculture [CEA] through serial investments in Farm8 and PlanTFarm, leading Korean agribusiness and vertical farming ventures," Sky Kurtz, Pure Harvest founder and CEO, said in a statement. "They understand the market opportunity and the merits of our solutions, and IMM will bring tremendous value supporting our expansion into Asia. Most importantly, we share the same values and vision for building a more resilient and sustainable food system for the world, tackling food security challenges, and localizing food production anywhere – even in the harshest climate environments."

Pure Harvest operates three indoor farming facilities in the UAE — mainly growing tomatoes, strawberries, and leafy greens — with a further two under construction in Kuwait and Saudi Arabia. Once complete, the five farms will cover 18 hectares and employ around 300 people, according to the Abu Dhabi-based startup. "We will use the proceeds to fund our existing [Persian Gulf region] projects, to drive R&D initiatives, and to expand our team, while at the same time seeding a beachhead in Asia," said chief financial officer Tariq Sanad.

The collaboration with PlanTFarm will add over 100 new crops to Pure Harvest's portfolio and expand the number of indoor formats it offers, enabling it to be an "omnibus" CEA solutions provider.

Read full @ https://bit.ly/3GuLnhL

Source : agfundernews.com

# Onato scores seed funding to digitalize India's fruit & veg supply chain

Onato, a B2B online platform for fresh produce, has raised $2.2 million in seed funding. The round was led by Vertex Ventures Southeast Asia & India — an affiliate of Singaporean sovereign fund Temasek — with participation from local agri-foodtech VC firm Omnivore.

The Bengaluru-based startup said it will use the funding to grow its team and scale up its operations.

Onato was launched in February this year by Vedant Katiyar — who had previously founded another data-centric agtech startup, called Gobasco — and Ashish Jindal, an engineer who has served stints with Amazon and food delivery unicorn Swiggy, among other tech companies. According to Katiyar and Jindal, India's fresh fruit and vegetable industry is worth over $100 billion per annum. However, it is plagued with inefficiencies — from unreliable payments and arbitrary pricing, to lack of access to financing and other resources — which mean that the market, and its stakeholders, are losing out.

"More than 60% of the population of India is dependent on agriculture, and yet tech penetration in the agri-supply chain is quite low. Decision making is mostly intuition-driven, which leads to a lot of volatility in prices and wastage," Katiyar said in a statement. Onato aims to solve these problems using data and technology to enable price transparency and enhance fulfillment. The platform seeks to link suppliers and buyers of fresh produce across India, opening up more buy and sell opportunities for players on both sides of the transaction while also facilitating more timely payments. The startup vets all users who apply to join the platform, and promises that all user data is "100% safe and secure" and is never shared with third parties.

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Source : agfundernews.com

# FarMart raises $10Mn in a Series A investment led by Matrix Partners India

Food supply software platform FarMart has raised $10 million as a part of its Series A funding round led by Matrix Partners India, the company said.

The round also saw participation from Innoven Capital and existing investors Omidyar Network India, Avaana Capital, and 500 Startups.

Angel investors participating in the round include Amit Lakhotia, founder, Park+; Jitendra Gupta, founder and chief executive officer (CEO), Jupiter; KP Balaraj, founder, WestBridge Capital and Sequoia Capital India, OfBusiness founder's fund; Revant Bhate and Dhyanesh Shah, co-founders, Mosiac Wellness

The funds raised will be used to expand FarMart's distribution network across the country, scale product capabilities as well as grow the team. The round also provides an exit for its early investors Indian Angel Network and LetsVenture. FarMart's fundraising announcement comes soon after its $2.4 million pre-Series A funding in June. FarMart is a micro- software-as-as-service (SaaS) platform for food supply. Its mobile app allows agri-retailers to serve their farmers better by providing access to information, market linkages and input. Large food businesses leverage FarMart's technology and distribution network to source quality produce directly from the farmers at reasonable prices.

"This fundraise is a true reflection of the vision we have at FarMart, which is to build an operating system for the agribusiness community in India, starting with agri-retailers who are at the core of our business. Our remarkable growth over the past few months is testament to our thesis of building a product-first and an asset-light business, driven by our amazing team," said Alekh Sanghera, co-founder, FarMart.

Since launching the market linkage platform six months back, the company has scaled its network to over 15,000 active agri-input retailers and 750,000 farmers who have shipped over 30,000 tonnes of produce on the FarMart platform.

"We are excited to continue supporting FarMart on their mission to create an innovative asset-light, tech-led model built to help the company with its strategy of helping agri-retailers and farmers increase their incomes. In less than a year, the company has shown impressive growth in its merchant base and revenue while also working towards creating meaningful lives for the farmers and agri-input retailers they work with," said Madhav Tandan, director, Omidyar Network India. The FarMart platform currently has over 100 business buyers including ITC, Olam, and Cargill.

"We are big believers of Alekh & Mehtab's vision of creating a capital-efficient and seamless food distribution network for the agri-retailer and the farmer community. FarMart's tech-led scalable model makes them well-positioned to disrupt the $300 billion agriculture market and their extremely strong growth over the last six months is a testament to their model and execution. We're excited to be a part of this disruptive journey with the FarMart team!," said Sudipto Sannigrahi, vice president, Matrix India.

Source : www.livemint.com

World Press

# Violence Strikes, and India's Farmers Want You to See It

**A year on, protesters against the country's agricultural laws are taking an increasingly confrontational approach with the country's leaders.**

The jeep plowed into the protesters, sending bodies tumbling, the windshield cracking against bone. The son of a prominent politician was then accused of murder. Rifle-toting security personnel flooded the area. Tempers flared so hotly that local officials shut down the internet.

With that series of events, a yearlong protest by farmers against the Indian government escalated into a dangerous new phase. Frustrated at what they see as intransigence by Narendra Modi, India's prime minister, over a series of new agricultural laws, the farmers have taken a more confrontational approach with the country's top leaders. They are now shadowing top officials of Mr. Modi's government as they travel and campaign, ensuring their grievances will be difficult to ignore.

The farmers blame government supporters for the jeep incident in early October, which left four of their number dead and killed four others, including a local journalist. But the incident shows that farmers who have camped outside the Indian capital of New Delhi for months are increasingly prepared to take their protest directly to government officials' doorsteps. "This is now a fight for those who died," Jagdeep Singh, whose 62-year-old father was among those run over by the jeep, said from the family farm. "And those who are living, this is now a fight for all of us until we die."

Elsewhere, under the harsh light of an LED lamp in an unfinished brick farmhouse, Ramandeep Kaur wept over the loss of her cousin, Lovepreet Singh, a 19-year-old who was studying English in hopes of getting an education and living in Australia.

"Until they take back those laws," she said, "the farmers' agitation will continue." The deadly incident took place in a remote corner of Uttar Pradesh, India's most populous state and a prize in elections to be held early next year. The protesters were shadowing top members of Mr. Modi's Hindu nationalist Bharatiya Janata Party, or B.J.P., as they began to campaign.

The farmers' goal is not necessarily to defeat the B.J.P., whom polls suggest will cruise to an easy victory. The party's top elected leader, Yogi Adityanath, is a Hindu monk and protégé of Mr. Modi who is popular with the party's Hindu base, and the opposition is fragmented. Instead, the farmers aim to draw more national and international attention to their plight.

The protesting farmers think that Mr. Modi's market-friendly overhaul last year of the nation's agricultural laws will put them out of business. India's Supreme Court has suspended implementation, and the government has proposed a series of amendments. The farmers balked, saying they would settle for nothing less than their full repeal.

Further action could take years, given the court's full docket, but the farmers fear the suspension will be lifted if they let up. No one disputes that the current system, which incentivizes farmers to grow a huge surplus of grains, needs to be fixed. The protesters fear the speed — the laws were passed in mere weeks — and the breadth of the changes will send the price of crops plunging. Mr.

Modi's government argues that introducing market forces will help fix the system.

"The composition of farming has to somewhat change," said Gopal Krishna Agarwal, a B.J.P. spokesman on economic issues. "The farm sector needs heavy investment, and that can come from the private sector."

Mr. Modi has responded to the protesters by waiting them out, a strategy apparently driven by the calculation that their movement does not represent a coherent political threat. Many of the protesters come from India's minority Sikh community, while the B.J.P. draws its political power from rallying the country's Hindu majority.

"'Farmers' is not a category that the B.J.P. uses," said Gilles Verniers, a political science professor at Ashoka University. "They talk about the poor and they speak the language of caste and obviously the language of religion."

Farmers have sought to get not only the B.J.P.'s attention, but the attention of the nation. A series of confrontations with B.J.P. leaders since September may not sway the election in Uttar Pradesh, but it could revive support across India and even globally for a protest movement that appeared to have been running out of steam, Mr. Verniers said. Though the protests have been largely peaceful, they have spurred occasional bouts of violence. In January protesters and the police clashed after some farmers drove their tractors into New Delhi. Protest leaders have distanced themselves from a shocking incident earlier this month at the farmer protest camp outside New Delhi, in which a group from a Sikh warrior sect killed and cut off the hand of a lower-caste Sikh, a Dalit, who they accused of desecrating a holy book.

The B.J.P. needs the campaign in Uttar Pradesh to go without a hitch, despite the party's lead in the polls. The party is trying to bounce back from the coronavirus's second wave, which hit after Mr. Modi declared victory over the pandemic and showed the country's lack of preparedness. Uttar Pradesh was hit particularly hard, with bodies of suspected victims washing up on the banks of India's sacred Ganges River.

While Mr. Modi, normally voluble, has said little about the farmers, other leaders in his party have embraced a language of force to rally supporters against them.

In Haryana, a state neighboring Uttar Pradesh that is also governed by the B.J.P., a local official was captured on video ordering the police to use violence to break up one gathering. Farmers responded by breaking through police barricades outside a government office. The tensions eased only after the government agreed to investigate the official's conduct.

A week later, in Uttar Pradesh, Rakesh Tikait, a 59-year-old farm union leader, rallied tens of thousands of farmers, declaring an all-out campaign against the B.J.P. Earlier this month, farmers gathered again in Haryana and surrounded the site of a planned visit by the state's top elected official, forcing him to cancel. Days before the incident in Uttar Pradesh, Ajay Mishra, Mr. Modi's junior minister of home affairs, warned farmers in a speech to "behave, or we will teach you how to behave. It will take just two minutes."

Outraged, a group of farmers stood on a one-lane road in the village of Tikunia, carrying black flags they planned to wave at Mr. Mishra, who was visiting his constituency with his son, Ashish Mishra, and other party members.

The farmers received word that Mr. Mishra's plans had changed and started to disperse when Ashish Mishra's convoy came hurtling at them from behind, according to video footage and police officials. After the jeep rammed into the crowd, the farmers attacked the convoy with bamboo sticks and set two of the vehicles ablaze. By the end of the day, eight people were dead, including three people in the convoy.

The farmers claim that they saw Ashish Mishra, known to villagers as Monu, in the convoy and blamed him for the incident. The minister has denied his family's involvement. The police arrested Ashish Mishra, saying he failed to cooperate with the investigation, along with nine others in the murder case.

The victims' families said they have little hope of justice. "Long live Monu," village walls proclaimed in graffiti next to a brightly painted lotus flower, the B.J.P. symbol. The Mishra family home, a sprawling compound hidden behind high walls and flowering bougainvillea, hovers over shanties. Opposition leaders have tried to capitalize on the moment, but many were prevented or delayed from reaching the victims' families. Some, including Priyanka Gandhi Vadra, a leader of the Congress party, were detained.

"All I can say is if, as a nation, we have a conscience," she said, "then we cannot forget this."

By Emily Schmall, Hari Kumar and Mujib Mashal

Source : www.nytimes.com

Question

# Q&A

Answer

## 01 SUGGESTION AND EXPERT OPINION REQUIRED TO GROW FRUITS AND VEGETABLES

***newenthu:*** *Hello, I have agricultural land in Kerala near Kumbla, Kasargod. I am not an agriculturist or farmer but highly motivated to grow good fruits or vegetables which should be tasty, look awesome and grow abundantly.*
*The idea is agro-tourism for school students so that we can share knowledge and best practices with all.*
*The soil test reports are as below:*
*pH: 5 - 8 Acidic*
*TSS: 0.06 normal*
*Organic carbon: 2.77 High*
*Phosphorus: 5 - low*
*K 90 Low*
*Good water is available in the land and the water pH is 6.3*
*It is flat land with all types of grass due to the rainy season.*
*I am attaching the soil test report (in Malayalam) if that helps to give us valuable advise*
*Thank you in advance*

***Answer 1 -- garao56:*** Please do not worry about the test reports, we can add soil amendments to improve its structure and proper fertilization of land and agronomic practices. Please inform what type of fruit crops you are willing to take up, in the inter space vegetables can be taken up. What is the extent of land .

***Answer 2 – muraly menon:*** What you make is not a subject, but what we need is the subject. What ever you produced, which are rejected by the market or buyer, what you will do with your product. So, before producing any thing make sure, a buyer with 100% buy back agreement. This agreement will get easy bank loan.

## 02 NEED PRACTICAL TRAINING ON COCONUT PLANTATION - VALSAD, GUJARAT

***punitkansara :*** *Hello, I live in Valsad, Gujarat. I am planning to plant hybrid coconut in my small farm (by organic method). I need some practical training for the same. Members from the nearby areas of Valsad. Please guide me. Also feel free if you have some suggestions for getting such training. I tried Krishi Vigyaan Kendra but that was not much useful. Thank you.*

***Answer 1 – garao56 :*** If you are going for hybrid coconuts go for plantation of DJ Sampoorna Hybrid, Till bearing use traditional cultivation after starting bearing go for organic farming for best results

*punitkansara: Thank you for your valuable response. I have researched the recommended variety and have contacted them. Have a wonderful day.*

***Answer 2 –garao56:*** If you decide whtat type variety of coconut plants to be raised we will guide you, so much training is not required

*punitkansara: Thank you Sir, I had checked with Deejay variety but they are very costly, around 600-650 rs each plant.*

*I am looking for some other good hybrid varieties txd or dxt*

***Answer 3 –garao56 :*** What is the extent of land you are taking up for coconut cultivation, if the area is more than 5 acres then 35 % subsidy is available from National Horticulture Board provide you avail a loan of 25 - 50% of the project cost . Please approach us for guidance

## 03 SPIRULINA CULTIVATION

***mahi_136 :*** *Hi, I am planning to start Spirulina Cultivation, If anybody has an idea about marketing/Buyers for this product and how the market trend will be?*

***Answer 1 -- garao56:*** There is good demand but marketing channels are to be ascertained

***Answer 2 –minalahm :*** Good afternoon sir . Actually spirulina has very high demand nowadays. I can give full guidance . Please contact if interested.

***Answer 3 –bhavsinh:*** Please send planing details.

## 04 WHAT CAN BE GROWN IN MY LAND (KAMRUP DISTRICT)

***dewki_k:*** *I need suggestion what to grow in my land (Kamrup district). Planting areca nut is possible, but apart from that, can someone suggest medicinal shrubs, plants that can be grown which has high demand so that continuity is maintained? We wont have constant farm help hence something that takes less supervision. Till a year back, we leased it for paddy cultivation but now we want to utilize the farm throughout the year, where the herbs can have constant buyer. Teak, Agarwood, wood for timber is also not preferred as it takes few yrs plus to yield.*

## 05 NEED TO START MUSHROOM FARMING

***sharan82 :*** *I am new in the business. Need to start the mushroom farming on a small scale. I have 40/30 Sq.Feet basement and want to start on that. Before starting need to your help to clarify following points.*
*1. Can we do the this farming in basement or not?*
*2. Is Dampness/Seelan on wall impacts Mushroom cultivation. If yes then what would be the solution*
*3. Since we are planning to start in this month with Button masroom, please let me know the contact details suppliers of (Compost, Spon, and bags) in Delhi NCR*

***Answer 1 -- garao56 :*** Please contact us for cultivation aspects and project report .

***Answer 1 -- rcdixit :*** Consultants available in Indian Medicinal & Aromatic Plants Trust Lucknow(U.P.)

***Answer 2 –bonvive :*** Please send your contact to discuss in details about The land report & possible herbs, tenure & your choices.

***Answer 3 -- muraly menon :*** Any business including farming, the benifits or profit will take some time. If you have time to wait, prepare the planing and budget as per your status. Before planting any thing, think regarding the sale or buyer. If your product can sale 365 days in your local market without any middleman, then you can continue. Governments (central & state) will help only finance and you have to market and sale before the product become scrap. If the product (vegetable & fruits) can't sale in time, 50% will become damage and your profit will become HALF. So, before planting any thing keep ready a buyer and sign 100% buy-back prior agreement with buyer.

Kindly contact for more details.

## 06 CONSULTANCY REQUIRED

***hanifkasu :*** *I am from Ratnagiri. I am having vacant agricultural land of almost 5-acre and now I am planning for the cultivation of that land. In this regard, I need a consultant to develop this land for Agriculture.*

***Answer 1 – garao56 :*** If you are planning for any horticultural crops please go for fruit crops or any plantation crops . If the land is more than five acres such as 5.25 or 5.75 or above 5 five acres you are eligible for getting 35% subsidy for development of commercial horticulture from National Horticulture Board.

If you want any land development loan for general cultivation please contact us for project reports and for technical guidance

## 07 HOW TO GET RID OF JUNGLEE GRASS?

***fair-deal :*** *How to Get rid of Junglee grass.? Which comes every year even after cutting to ground level.*

***Answer 1 -- garao56 :*** Deep cultivation in summer supplemented by 2,4 – D Sodium salt at 2-4 kg/ha before onset of monsoon completely controls this grass as it checks the regeneration

***Answer 2 –minalahm:*** Hii good afternoon sir. I am from Assam , Hojai District. I am a plant supplier. Actually . I have an lot of medicine available to kill jungles grass or other grass. So I can I guide and suggestion any moment.

## 08 HOW TO GET THE POTENTIAL YIELD OF TURMERIC IN ORGANIC FARMING?

***infiniteg:*** *How to get the potential yield of Turmeric in organic farming?*
*Can we use any biostimulant for increasing yield?*

*vdeepakrao:following the post..!*

***Answer 1 -- garao56:*** First of all convert your land into Organic farm by proper cultural practices, it will take atleast 3 years for getting standard yield. Get organic certification for quoting higher price for the produce.


Image Source : https://encrypted-tbn0.gstatic.com

***Answer 2 -- yogikm :*** yogikm Strictly increase the aeration and micro nutrients content of soil.Use only organic manure from your own land. Never uses chemical ,use drip irrgation for soil to retain moisture content.

***Answer 3 -- garao56:*** Abundant manuring ( FYM - 10 tons per acre) and other organic growth stimulants and with timely irrigation yields can be maximized

***Answer 4 -- zuber6:*** We supply vermicompost for organic farming. Contact for orders

***Answer 5 -- shajathali :*** Connect me I will link my turmeric farmer who will help you.

***Answer 6 -- garao56:*** Balanced nutrition and good agricultural practices are enough for getting proper yield

## 09 WHAT ARE FEW CROPS THAT SELL WELL AND ARE NOT QUICKLY PERISHABLE?

***kevin256 :*** *I'm interested in part time organic gardening/ farming. Currently grow around 1,000 lbs produce annually for my family (includes heavy stuff like melons, squash, potatoes so not that impressive).*
*I want to expand and try my hand at a farmers market or direct to consumer. But for the first few seasons I'd like to focus on items that I can store in a cool dry place and sell slowly.*
*I'm thinking that winter squash, pumpkins and gourds, ornaments corn, heirloom potatoes, while not the most valuable can be stored for some time without the need for a cold room like leafy greens require.*
*Any thoughts or suggestions?*

***Answer 1 -- organic84:*** Hey, There are many crops that sell are very good and they are not perishable quickly.
1.) Cabbage:- A vegetable with an amazing shelf life is cabbage. You should avoid washing or cutting your cabbage until you are ready to consume it, as this can cause bruising, which can shorten its longevity.
2.) Lemons and Limes:- lemons and limes can last two weeks when left out and up to a few months when kept refrigerated. The best way to store them in the refrigerator is in a crisper drawer whole. Do not store them in a container as it can make them go bad more quickly.
3.) Carrots:- The best way to keep carrots for longer is by choosing fresh, whole carrots. When in this state, carrots can be kept in the vegetable drawer of your refrigerator for four to five weeks.
There are many more other crops that are not Perishable quickly and if you want to produce your crop in a more effective way then you should also use organic Products.
***Answer 2 – vmap :*** Hi sir/madam It is better to go cultivation of ground nut OR you can choose medicinal plant cultivation and select only demandable plants that to suitable to your land.

Question

# Q&A

Answer

***Answer 3 – orgfarm12 :*** grain and oilseeds depending on your ground

## Q10 WANT TO START GOSHALA IN CHENNAI

**krishnasw :** *As a social responsibility, want to start Goshala for abandoned cows. Any guidance?*

***Answer 1 -- garao56 :*** Dear Sri Krishnasw, Now a days farmers are carrying out agricultural operations by mechanisation, without using of animals like bullocks and he buffaloes and also they are not at all apply any farm yard manure to land thereby destructing the physical structure of the land by adding chemical fertilizers. Even they are leaving the cows in the streets as they are unable to feed them.

Generally temple trusts and other voluntary orgainsations are maintaining Goshala's here and there with the active help of philanthropists and like minded people. some temples are also maintaining the same with their own funds. Individuals who have dedication and love for cow rearing are coming forward for maintaining Goshalas.

All infrastructural facilities are to be arranged such as,

1. cattle shed
2. water troughs
3. Procurement of paddy straw
4. Arrangement for raising fodder crops
5. Trevice for treating the animals
6. Care taker
7. Veterinary services from the Veterinary Department
8. Medicines
9. Maintenance of breeding bulls for improving the progeny of the local breeds etc
10. Maintenance of vermi compost unit for income generation for meeting maintenance expenses of the Goshala.

Some cases here and there the animals were died due to feed poisoning and other reasons and hence one must be vigilant and continuously take care of the animals by taking prophylactic measures against diseases and ailments.

One Sivalayam at Yanamalakuduru near Vijayawada in AP has been maintaining Ongole breed of cows and bulls. Some animal lovers voluntarily coming and supplying fodder and concentrated feeds now then to the animals without insisting by any body.

Kindly take up the same for saving the native animals who have protected the human beings before civilization but now a days humans are neglecting the cows who have supported our forefathers.

Wishing you all the best and requesting the public to help in sustenance of the Goshala

## Q11 START DAIRY FARM BUISNESS

***vraj2222:*** *Hello Friends, My Name is Jignesh Parekh & I am planning to start My Dairy Farming Near to Vadodara, Gujarat.*

*Current Planning with 10/15 Gir Cow + Land on Lease / Sell.*
*Can anyone Guide me in that business?*
*I am also looking for Partner.*
*I am also looking for some consultant*
*My Land Requirement is shown below-*
*1 - Land Should be within 40km from Vadodara*
*2 - Land should be as much as near to Road*
*3 - Land must be an Agriculture & Water Facility should be there.*

***Answer 1 -- garao56 :*** After getting partner please approach us for project report and guidance . There will be subsidy of 25% for 10 animal unit under DED scheme of NABARD which will be renewed in this month generally. G.Anandarao B,Sc(Ag)

*abinand20 : Dear Mr Anandarao, My name is Rajiv lohi. We would like to start a diary project in kerala .we would like to know more about the feasibility and consultancy.*

***Answer 2 -- somkar :*** As you have NOT given your mail ID and contact no-- we cannot contact you


You can post or mail your short introduction , so that we mail you google form to fill in , and then we mail ---- you all details about 1)Pre-startup, 2) Startup and 3) 12 months for existing dairy farms, 4) also 14 products, ONLINE -4 hours trainings on 37 topics of cow mgmt 5) MONTHLY ONLINE AUDIT services

## Q12 NEED GUIDANCE FOR MAIZE PROCESSING INDUSTRY

***subbu577:*** *I want to install a maize processing plant can any body please help me by briefing it.*

***Answer 1 -- ashishp111:*** One of my friend at Vadodara (Gujarat) having food processing machinery manufacturing unit, with experience of so many factories related to pulses and maize too. They have experience of so many years in this field. If you are interested , please send me your mobile number or contact me.. Mine is 9978810491.

***Answer 2 -- futurezen :*** Please connect to us. we have already done projects on maize

***Answer 3 – atas2020:*** If you are still looking for maize processing machinery, please connect with me. We have installed many successful projects all over India and overseas.

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