Vadamalai Media Group April 2021 - ₹80 A Stribute Survey

India's Leading Business Magazine for Agriculture



Dr. R S Minhas, Chairman, Stone Fruit Growers Association of India Padmashree Subhash Palekar Indian Agriculturist

> Ratnakar Rai Director, Poorna Agrisystems

Dr. A. B. Rema Shree Director, Spices Board, Kochi

> Dr.Raja Shankar Principal Scientist - IIHR

Padmashree Subhash Palekar - Explains that God first created the earth, water, vegetation and then vegetarian animals including human beings. Then, to control the animal population, God created non-vegetarian animals. There were divine laws constituted to manage this entire system with balance.

Venkata Narasimha Raju - "We are the leaders in the market when it comes to mango ripening. In the past 7 years, approx. 30,000 tonnes of fruits have been ripened at our establishment."

Dr. R S Minhas - In addition to being the Chairman of Stone Fruit Growers Association, Dr.R S Minhas is also heading an Organization working for small and marginal farmers of Himalayan region in the field of organic farming Partha Varanashi -- Takes you from the surface to an in-depth understanding of the world around us and we realise that what we need the most in agriculture is in-depth understanding, respect and trust in nature and patience.

Raja Kumaran -- An electronic integrated company who is into the manufacturing of irrigation automation controller systems since 2010. Our business theme is irrigation automation.

M Ramakrishnan -- "We do quality assessment using images and artificial intelligence. I will briefly walk through what we do and how we bring value to the agricultural ecosystem."



VAIKUNTH MEHTA NATIONAL INSTITUTE OF CO-OPERATIVE MANAGEMENT

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ADMISSION NOTICE

POST GRADUATE DIPLOMA IN MANAGEMENT- AGRI BUSINESS & MANAGEMENT PGDM- ABM (2021-23)- 29th BATCH

(Approved by All India Council for Technical Education & Recognized as equivalent

to MBA degree by Association of Indian Universities & accredited by National Board of Accreditation, New Delhi)

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ELIGIBILITY FOR ADMISSION

Any Graduate from a recognized University, with minimum education of 15 years full time education (10+2+3) with at least 50% marks for General/OBC (non-creamy)/EWS candidates and 45% for SC/ST candidates in graduation and having valid test scores of one of the National Level Common Entrance Tests - CAT / MAT / XAT / ATMA /GMAT/ CMAT of AICTE. These guidelines may get modified / subject to be modified depending upon AICTE or Government guidelines from time to time. Candidates appearing in forthcoming degree examinations can also apply subject to fulfillment of conditions by 14.08.2021. Reservation of seats for OBC (Non Creamy)/SC/ST/Differently Abled persons and wards of Kashmiri Migrants and Kashmiri Pandit/Kashmiri Hindu families (non-migrants) living in Kashmir Valley as per Govt. of India rules. Few seats are available for wards of NCCT / NCUI /VAMNICOM employees, co-operative sponsored candidates and Foreign nationals at VAMNICOM. The Group Discussion and Personal Interviews will be conducted at selected centres during April/May 2021, subject to sufficient number of candidates opting for it.

HOW TO APPLY:

Applying candidates can apply online on VAMNICOM website and pay fees online. The prescribed application form may be downloaded from the VAMNICOM website and apply with valid score of CAT/ MAT / XAT / ATMA /GMAT/ CMAT of AICTE from 11th January 2021 to 15th April 2021 by post along with demand draft of Rs. 500/- in favour of "The Director, VAMNICOM, Pune".

NOTE: The Institutes which are conducting CAT/MAT/XAT/ATMA/CMAT/GMAT exams have no role either in selection or conduct of the programme.

Dr. K.K. Tripathy, IES Director, VAMNICOM

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PUBLISHERS NOTE

Creating a more equitable society

n India, it seems many institutions of the government seem to be becoming weaker and weaker and a bit getting disorganized.

Democracy can deliver its promises only when the many institutions enumerated in the Constitution, we have to repeat at the risk repetition, namely, the Executive, Parliament, Judiciary and the fourth pillar, the freedom of the press, and now we have to add TV channels that all get the move us as a free country.

There are many imbalances and deficiencies. As we move on as a free country and these shortcomings and imbalances are repeatedly pointed out, more so as we come to encounter and more frequent elections to the many State Assemblies and Parliament and let us also admit and recognize that things are improving and moving in the positive direction that as a large democracy in the world Indian democracy is winning. Recognition and India are becoming a most admired democratic country and society.

Yes, there are many more desirable things to do to make Indian society much more open society and liberal democracy.

India as we write in also undergoing a very contentious election process and we are witnessing very noisy and much more controversial phases. Electoral malpractices like moving large quantities of unaccounted money through many devious means are getting more and more public attention.

Also smaller parties, more youngsters and more false promises and much such distribution of freebies, why even such blatant promises like free gifts in cash like Rs.6,000 per month to each citizen, why even many other such false promises like wiping out all government loans why even such loans like gold and jewelry pledged to the cooperatives are all impossible to implement and yet at the heat of the election rhetoric, such promises are thrown out and gullible people might be carried away.

There are many other disgraceful pronouncements and use of foul language sued by opposition candidates. The current elections underway had exposed the entire election process cried out on such false foundations. The State governments are in deep debt, there is a heavy burden on the citizens but who care for such niceties. So, the whole atmosphere is vitiated.

Parliament is not functioning as it should. Its days of functioning are cut progressively. The judiciary is also handicapped by large-scale vacancies and the piling up of pending cases is causing a great many problems.

There are many weighty issues. The very spirit of the people the very electoral process, the very heart-beat of the democratic society is becoming a great issue.

There is no transparency in governance from the top to the bottom.

Only may be, the spread of education and the exchange of widespread impact outside world might bring about the needed information and understanding of what is right and wronged other values of civilized living can create n atmosphere for a civilized society.

Anyway, we need more and more a reformed education and a better society to make the minds of citizens more filled with good values and moral commitments.

Let us hope. Then only poverty and deprivation would away and more healthy citizens of a more improved and more equal and free society can come into being.



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Four months old farmers' protests prolong!

How long this state of affairs to prolong? Surely, there must be a way out!

griculture and farmers' lives are so precious! The country and political leadership owe the people this much of sensitivity and moral burden!

The Prime Minister's 75th edition of Mann ki Bath has come timely as this edition deals with the PM's concern for the farmers' welfare and the PM specifically deals with the problems of farmers. The PM calls for the modernization of farming in the country and he expresses his view that farming in India needs to be modernized as the Agri sector is so critical for Indian economic strength and raising of farmers' incomes. The PM pointedly calls attention of farmers in Banaskantha in Gujarat and Yamuna Nagar in Haryana where beekeeping has spread so fast and sly and it has helped to raise farmers' income in these regions. It is so nice to see the PM's reference to the farmers' problems and let us hope the PM's reference will take him further to the needs for farmer issues.

There are many daily happenings like the one just before the PM's speech that one BJP M.P, one Narang went to meet the agitating farmers and as per reports, the voting MP was hit and there was some further flare-up, likely. But the pity is the PM's almost day-to-day discourses touch many issues of critical importance, there is no reference to the development as the media is also likely to shy away from this messy state of affairs. Agriculture is, to say the leastwise an unglamorous fields and there is not much money to make in this very uncertain field.

The governments elk of farming and farmers only when the rains fail or when there is a food shortage.

By the way, the rains have been good this year so far there is likely to be enough run water in the reservoirs the farmers are likely to face much more indifference as there are reports that food production is going to be enough to face the internal needs at least and the government seems to be very stubborn in sticking to it. Sort of rigid stand and three contentious laws on farmers issues are unlikely to be relaxed.

We can't guess the motives of the policymakers to stick to their own persistent rigidity.

This magazine is published by a family that is engaged in actual farming and also in direct touch with farmers and villagers.

India, seen from the interiors of the villages, more so in the South's still a poor country and the vast majority of the farmers are very poor compared, say with rural China, a visit to China would confirm India is at least 10 to 15 years backward. So, let Indians, more so the agricultural policymakers must realize that we have to approach farmers' issues with a great deal of sympathy and open-mindedness.

To be born as a farmer in India, we like to repeat a curse the average life of a farmer is like a hell.

The usual view of a rural farmer is either a debtor or a litigant. An Indian average farmer is never a free citizen. He is tied to the whims and fancies of petty bureaucrats and the Indian petty bureaucrat is conditioned to extract a small or big bribe depending on the circumstances. And given the current Indian political scenario as we write these lines there are a multiplicity of elections and the media carry a lot of juicy stories. Every day villagers are approached by the political parties every day to carry party banners and each one villager is paid either Rs.300 or even Rs.500 to carry either the party flag or other publicity material for some three or four hours. That is how the election campaigns are conducted and crowds

are collected. For the visits of the heavyweight leaders who'll use these days charted flights from Delhi to the end of the country till the Cape Camorin!

There are no more secrets about how the election funds are collected and the sources of the funds. Daily reports how much funds are collected these days are a plenty and people have started to speak out their anger and disappointment about the false promises and false freebies.

From the PM to others who don't have any hesitation about the lies and also the vulgar tongues displayed make one sick of the direction the elections are conducted, elections won and lost!

As for the election-eve promises to voters areas many falsehoods and also the language of the elations is no display of any educational value. It is all so vulgar and demeaning to public morality.

Among the many promises, one false promise stands out. That is about creating jobs for the rural youth.

Creating employment opportunities. Is a widespread promise and yet what do we, the rural people find these days?

It is the scarcity of employment!

We pay the male labor Rs.500 a day, for the five-hour job and for the female labor Rs.300 to Rs 400 sometimes.

Yet there are not enough hands to go by. So the point is that farming is becoming un-remunerative and average Indian small farmers in deep debt!

So to lift Indian farming to a productive level is a complicated job.

In conclusion, we like to please the government to give the Indian farmers the freedom to bargain with the policymakers to give the freedoms to negotiate and get all the concessions so that first and foremost farming becomes a profitable job.

Indian farming is small farmers-based. So, let us give the farmers what they bargain for.

Let the government not stand on any adamant stand. This attitude is very sure to fail and might lead to further complications and chaos in the countryside.



here, scientists at Terramera Inc. are running test after test on plants and pests to develop chemistry technology that improves the efficiency, uptake and performance of the active ingredients in cropprotection products.

The Vancouver company's goal is to reduce synthetic chemicals used in agriculture

globally by 80% by 2030 while increasing farm productivity by 20%. "We can't afford this industry not to be brought into the 21st century," said Manhas, who founded Terramera in 2010.

Other players in the agriculture technology (agri-tech) space are also recognizing that conventional farming has not kept pace with rapid advances in technology. Earlier this month Terramera and eight partners got backing from the Digital Technology Supercluster in Vancouver, which divided \$20.4 million among six wide-ranging projects. Terramera's partnership with organizations including Compression. ai and Canada's Michael Smith Genome Sciences Centre will see otherwise disparate groups collaborate to develop



Inside two industrial buildings – one a fading dark grey, the other a burntorange brick – sitting side by side in Mount Pleasant, CEO Karn Manhas sees "pretty cutting-edge" innovations on the precipice of changing agriculture over the next decade.

commercial products – tapping into everything from robotics to genomics in a bid to improve crop health.

"Part of the value is to be able to see how other industries are solving similar problems," Manhas told Business in Vancouver the day the supercluster funding was announced.

"For us to have genomics facilities or all kinds of specialized facilities are quite

How Lady Rosetta helped Gujarat family earn Rs 25 crore a year

This family of 10 farmers has been minting money from a special type of potato, clocking a revenue of Rs 25 crore per annum, producing on average 20,000 metric tonnes! Jitesh Patel, a potato farmer from Dolpur Kampa village of Arvalli district, turned his and his family's fortunes around after using his education in agriculture science to begin cultivating the Lady Rosetta (LR) variety of potato.

That variety is widely used for manufacturing potato chips and wafers. Today, he and his family earn crores by supplying the potatoes to leading potato chip manufacturers such as Balaji and ITC. Patel's family has been growing potatoes for 26 years now. "After I completed MSc in agriculture in 2005, the goal was to return to farming," said Patel, adding, "Earlier, our family used to cultivate the table variety of potatoes. However, I decided to diversify."

Patel started cultivating the LR variety over a 10-acre land parcel in 2007. "Since the yield was good, I decided to involve other family members," Patel told TOI on the sidelines of Global Potato Conclave-2020 in Gandhinagar. "As on date, we are 100% into LR potato cultivation over a land parcel of 1,000 acres," he said.

Industry experts have underlined that the demand for the LR variety is poised to rise. "Potato chip manufacturers need consistent supply and quality of the LR variety," said Sachid Madan, chief executive, Technico Agri Sciences Limited. Read full @ https://bit.ly/3cNooQG Source : economictimes.indiatimes.com costly, so to be able to partner with other organizations that can expand and extend our capabilities allows us to move much faster." Terramera chairman Jeff Booth, who was appointed the company's board chairman after it raised US\$45 million from investors last September, said the potential for agri-tech still remains untapped compared with other sectors. It's why Booth, perhaps best known as the co-

founder and original CEO of e-commerce company BuildDirect Technologies Inc., also took on the chairmanship of agri-tech firm CubicFarm Systems Corp. (TSX-V:CUB) in late January. The Langley-based company has developed automated hydroponic growing chambers that look like shipping containers and offer a controlled environment for growing crops and animal feed.

"It's an untouched category," Booth said.

CEO Dave Dinesen said the technology came to fruition after the CubicFarm Systems founders visited Puerto Rico and saw the need to grow produce in any location (the U.S. territory depends significantly on imports).

Dinesen said automation within the chambers reduces the amount of land needed for growing.

"It ticks all the good boxes and makes indoor growing economical," he said. "Every 90 minutes, hundreds of trays of plants will pass by you so you can stand in one spot and do all of your harvesting and planting, and it lets us have much fewer lights than any other system, much less labour. And then because the machine brings everything to the worker at the front you don't need to leave any access hallways for people, so we get far more yield than any other system."

He said that for now most of the market is made up of the early adopters but he's certain that farmers will have no choice but to start using new technologies to make farming more sustainable.

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

Source : https://biv.com

Online Meetings

www.agricultureinformation.com

Upcoming events

APRIL 7, 2021

3:00 pm

Mr. Yadav Sanjay on "Usage of shredder cum mulcher in modern agriculture"

05.00 PM

Dr. P. P. Joy on "Processing and IT enabled technologies for pineapple cultivation" $\!\!\!$

APRIL 8, 2021

3:00 pm Dr. C. Subesh Ranjith Kumar on "Commercial floriculture and its prospects"

05.00 PM

Mr. Amol V Khandare on "Commercial cultivation & marketing details of stevia"

APRIL 9, 2021

3:00 pm Mr. Ananthamurthy Javali on "Cultivation of appe midi pickle mangoes""

05.00 PM

Mr. Rajender Kumar on "Cherries – A Profitable temperate crop''

APRIL 12, 2021

3:00 pm

Mr. Raju Kapoor on "Reflections on my more than 30 years of experience in the Indian agribusiness sector"

05.00 PM

Mr. Chandrashekhar Dattatray Mane on "Our experience with managing a Farmer Producer Company"

APRIL 14, 2021

3:00 pm

Dr. Satyen Yadav on "How can farmers set up agribusinesses? "

05.00 PM

Mr. Mohan Krishna Chowdry A on "How to identify plant pests and diseases on your own?"

APRIL 15, 2021

3:00 pm

Mr. Ashish Anand on "Advancement in high-tech farming and doubling the income with the same piece of land"

05.00 PM

 $\ensuremath{\mathsf{Mr}}$. Shreyas G. Khakal on "Digital marketing and online presence for agricultural business"

APRIL 16, 2021

3:00 pm

Dr. Shyamaranjan Das Mohapatra on "Digital Pest Advisory Services: A quick way to deliver pest management information to farmers"

05.00 PM

Dr. Sunila Kumari on "Current status and potential of dragon fruit farming in India"

APRIL 19, 2021

3:00 pm

Dr. Sheetal Sharma on "Sustainable soil management options to improve the profitability of rice"

05.00 PM

Mr. Sivakumaran R on "An incredible journey : Programmer to progressive farmer"

APRIL 20, 2021

3:00 pm

Dr. Prakash Mali on "Grape cultivation best practices"

05.00 PM

Prof. Shakeel Ahmad Khan on "Impact of air pollution on crops"

APRIL 21, 2021

3:00 pm

Mr. Ashok Kumar Trisal on "New technologies in horticulture – exotic/hybrid vegetable production"

05.00 PM

Mr. Phibi Philip Naduvathu on "How to set up sustainable aquaculture $\operatorname{project}''$

To participate in these online meetings please visit www.agricultureinformation.com and click on BECOME PREMIUM MEMBER

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Online Meetings

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Meetings in Archive

Mr. Deepak Pareek on "How blockchain can solve agriculture challenges"

Mr. Deepak Pareek is the Managing Partner & Chief Consultant of HnyB Tech-Incubations and Founder of AGriChain, DigiAgri, MyCrop in Ahmedabad, Gujarat. He says HnyB, is creating an ecosystem to deploy cutting-edge technologies including Machine-Learning, Blockchain, GeoSpatial, Computer-Vision, Drones and IoT for improving profitability and productivity of marginal farmers on one hand and providing valuable insights to agriculture ecosystem participants on the other. To know more view https://bit.ly/3bciPvD

Mr. Jayant Vaman Barve on "Bio nutrient management for soil fertility"

Mr. Jayant Vaman Barve is the Chairman, Nature Care Fertilisers Pvt. Ltd. in Vita Dist, Sangli, Maharashtra. He says we should always increase organic carbon in the soil and use herbal preparations like neem, garlic, chili extracts for plant protection. Only bio culture and biocides should be used for for any issues in plantation.

Mr. Ganesh Prajapat on "Complete solution for large scale, high tech, mechanical Guar Seed Cultivation"

Mr. Ganesh Prajapat is an Agribusiness Consultant at Agro Tech Agriculture Consultancy in Jaipur, Rajasthan. For the past 12 years, he provides consultancy service in various agriculture fields, like medicinal and aromatic farming, guar cultivation, stevia farming, agriculture risk minimization, agriculture insurance and others . Mr.Ganesh Prajapat has served various Indian and overseas clients as agribusiness consultation.

Mr. Ambaprasad Nerlikar on "My experience with viable organic farming"

Mr. Ambaprasad Nerlikar is the Proprietor of Venugram Organic Fresh Mangalwarpeth in Belgaum, Karnataka. His interest is Organic/Natural farming. Their farm is a certified organic farm spread over 14 acres at Nerli Village, Belgaum District, Karnataka. Mr. Ambaprasad Nerlikar says, they do inter-crops in sugarcane. Sugarcane is planted in rows 6 feet apart and in between spaces they cultivate green gram, groundnut, all kinds of vegetables. They are growing many varieties of pulses, cereals, oilseeds, spices, sugarcane (for jaggery), vegetables, etc.

Mr. Rajeevan N on "My experience in cultivation, value addition & marketing of spirulina"

Mr. Rajeevan. N is the Managing Partner of Aquaseal Technologies and Infra Projects Solutions in Mysore, Karnataka. They have 25 years of experience in cultivation and production of spirulina spray dried alga powder and also into production of nutra spirulina fortified sweet peanut chikki under CFTRI Mysore licence. They also supply spirulina in capsule and tablet forms.

Dr. S. Narayanan on "Hi-tech cultivation of tissue culture banana"

Dr. S. Narayanan is the Sr. Vice President of JAIN Irrigation Systems Limited in Chennai, Tamilnadu. His interests are marketing of micro irrigation systems and planting material.

Dr. Sampriti Baruah on "Small Farmers Large Field (SFLF) collective action model for improving small farmers livelihood"

Dr. Sampriti Baruah is the Project Coordinator for Asia at International Potato Center in Bengaluru, Karnataka. Her interests are agriculture for development, livelihood dynamics, climate change adaptation and gender.

Dr. H.R. Bhargava on "How to produce unifloral, multifloral honey and its analysis"

Dr. H.R. Bhargava is the Director of Sri Annapoorneshwari Naturals in Bangalore, Karnataka. They are selling unifloral and multifloral honey under the brand name Swarna Madhu Honey, at Dasarahosahalli and are also promoting beekeepers to produce honey, propolis, pollen, bee venom and bee wax. Dr. H.R. Bhargava is a Master Trainer for Kadhi & Village Industries Commission (KVIC), Govt. of India for Bee Keeping. He has supplied 3000 bee boxes to Karnataka, Telagana, Andhra Pradesh and Maharashtra. His interests are anti-oxidative properties of honey, chemical characterization, application of propolis and bee venom, nelissopalynology of honey, detection of adulterants in honey and honey analysis.

Ms. Sopna Ciby Kallingal on "Integrated farming improved incomes in my 15 acre kallingal plantation"

Ms. Sopna Ciby Kallingal is a Farmer and Owner of Kallingal Plantation located on the foot hills of Vellani Forest in Thrissur District , Kerala. Kallingal Plantation is a 15 acre integrated plot with coconut, arecanut, nutmeg and pepper as main crop along with the main crops cocoa, coffee, plantain, variety fruits and vegetables are also grown as inter-crops. To know more view https://bit.ly/30FNvQ0

Dr. P. P. Joy on "Passion fruit cultivation, processing and marketing"

Dr. P. P. Joy is the Retired Professor of Agronomy from Kerala Agricultural University in Ernakulam, Kerala. His interests are passion fruit and pineapple. Dr. P. P. Joy says when he was the professor and head of Pineapple Research Station under the Kerala Agricultural University he had the opportunity to undertake a KSCSTE research project entitled "Evaluation of passion fruit types for commercial cultivation". The project was for a period of three years from 2012 to 2015 and a very good passion fruit variety namely 134P was developed at the station. The variety was supplied to different research stations under the Kerala Agricultural University for multiplication and for further multiplication testing.

Dr. Pradeep B on "How to make aquaculture successful"

Dr. Pradeep B is Subject Matter Specialist (Fisheries) at ICAR Krishi Vigyan Kendra, IISR, Kozhikode, Kerala. His interests are aquaculture, ornamental fish culture, freshwater and brackishwater aquaculture and fish diseases. To know more view https://bit.ly/2NbmSiA

Dr. Dinesh Kaippilly on "Business opportunities in Shrimp Farming"

Dr. Dinesh Kaippilly is officiating as the Head of the Department of Aquaculture, Kerala University of Fisheries and Ocean Studies (KUFOS) in Cochin, Kerala which is the first State Fisheries University of India. He was conferred as a FELLOW of World Aquaculture Society (which is a global organization headquartered in the USA) encompassing the scientific and business fraternities.

Dr. S.J. Ankegowda on "Black pepper cultivation - Advance production technology for better yield"

Dr. S.J. Ankegowda is the Principal Scientist and Head at ICAR-Indian Institute of Spice Research in Madikeri, Karnataka. His interest is production physiology of Spices; Black pepper, Cardamom. To know more view https://bit.ly/3rlIRwl

Mr. Binu Cherian on "What is Biofortification ? Technology for promoting biofortified food crops"

Mr. Binu Cherian is the Country Manager at HarvestPlus in Hyderabad, Telangana. HarvestPlus leads the global effort to improve nutrition and public health by developing and promoting biofortified food crops rich in vitamins and minerals. To know more view https://bit.ly/3cccqjF

Ms. Sangita Sharma on "How to conserve, propagate and create exchange networks for indigenous seed varieties"

Ms. Sangita Sharma is the Chair Person and Founding Trustee of Annadana Soil and Seed Savers Network in Bangalore, Karnataka. Her interests are regenerative agriculture, creation of food forests, seed conservation, sustainable living, foods that heal and empowering youth to be the catalysts for ecological change. To know more view https://bit.ly/3qloYoP

Mr. Surinder Singh Shekhawat on "Economic viability of growing olives – a pilot project in 182 hectares on 7 government farms"

Mr. Surinder Singh Shekhawat is the Chief Operations Officer at Rajasthan Olive Cultivation Limited in Jaipur, Rajasthan. He is specialized in modern hi-tech agriculture & horticulture technologies, micro-irrigation, waste land development, tree borne oilseeds cultivation.

Mr. Anant Raheja on "Nanofiber technology in agriculture"

Mr. Anant Raheja is the Director of FIB-SOL Life Technologies in Kanchipuram, Tamilnadu. He says nanofibers are a class of nanomaterials, which can provide a high surface area for encapsulation. They have utilised this feature to develop agri-formulations with high concentrations of active ingredients, in compact package size with improved stability. Some of the doses are in the range of 5 grams per acre, compared to their traditional pack size of 5 kilograms! The low dose size implies less wastage, faster application and better storage.

Mr. Sudhanshu Kumar on "Sharing my experience in growing litchi and directly marketing"

Mr. Sudhanshu Kumar is the owner of Orchards of Nayanagar in Samastipur, Bihar. His interests are growing litchi, direct marketing, automation in fertigation and micro irrigation. He also grows lot of maize, wheat and lentils and has mango & banana orchard.

Mr. Chetan Arun Raut on "Arunokalp Trust in Chandrapur where farmers are motivated and trained in integrated farming"

Mr. Chetan Arun Raut is the Secretary of Arunokalp in Chandrapur, Maharashtra. Mr. Chetan Arun Raut is a farmer's son from a village in Yavatmal District. Immediately after the completion of his engineering he realized that his education would not help him fulfill his and his father' dream of helping resolve farmers' crisis as much as they could.

Mr. Rajender Kumar on "Blueberries – A valuable upcoming commercial crop"

Mr. Rajender Kumar, Business Development Manager-South & East Asia, Cravo Equipment Ltd., Canada. The retractable roof production system or RRPS has been developed by Cravo over the last 35 years, to help growers create superior results using a system that combines the benefits of climate optimization, nature and protection. They have built up substantial experience through research and by partnering on projects across 6 continents in the fruit, berry, vegetable, flower and reforestation sectors. To know more view https://bit.ly/3kJeymi

Prof. Ajay Gupta on "Plant tissue culture of horticulture and agricultural crops"

Prof. Ajay Gupta is a Professor and Nodal Officer at Maharishi Markandeshwar (Deemed To Be University) in Nikalna, Ambala District, Haryana. His interests are plant tissue culture of horticulture and agricultural crops, fruit crops, flowering plants, mushroom production, organic farming, high tech nursery, medicinal plants research, extracts, CORDYCEPS SINENSIS, CORDYCEPS MILLITARIS.

Mr. Ravi Singh Choudhary on "How to reduce agri inputs and maximise the profit ?"

Mr. Ravi Singh Choudhary is the Director of Sampurn Krishi Utthaan Foundation in Ranchi, Jharkhand. His interest is strengthening agriculture practices by natural and organic farming. He will talk about LEISA (Low External Input Sustainable Agriculture). To know more view https://bit.ly/37bhEuc

Mr. Deepak Kumar on "How to get cost effective smart production in farming"

Mr. Deepak Kumar is a Research Scholar from Division of Agronomy, Sher-e-Kashmir University of Agricultural Sciences and Technology in Jammu. He says for our farmers we need to think about all available technology and resources in terms of their sustainable use as well as need to increase economic status of small and marginal farmers. We have to start with integrated farming system approach and rethink about existing application at our farm. Mr. Deepak Kumar says problems like herbicide resistance, pest resistance and many more are the results of our bad agronomic management practices which not only reduced the farm potential but also increase the burden of loan.

Online meetings are available only for Premium Members

Talking to

Padmashree Subhash Palekar

Indian Agriculturist

When human practices go overboard and unruly, there are chosen people who are gifted to see beyond what is there and advise corrective measures. For Padmashree Subhash Palekar, agriculture is not just science or a means of living. It is much beyond passion. Agriculture to him is divinity.

Palekarji explains that God first created the earth, water, vegetation and then vegetarian animals including human beings. Then, to control the animal population, God created non-vegetarian animals. There were divine laws constituted to manage this entire system with balance.

1. Vegetarians will eat only plant bodies - this applied to human beings too.

2. Vegetarian animals are not to eat non-vegetarian animals at any cost.

3. Non-vegetarian animals will eat only vegetarian animals to control its population.

4. Non-vegetarian animals will not eat plant bodies at any cost.

5. Non-vegetarian animals are not to eat other non-vegetarian animals.

> hich category would human beings fall under?

84L living beings are distributed among so many food chains by God. Human beings are not part of any food chain. All human characteristics sync up to the characteristics of other vegetarian animals. We are not anybody's food and neither is any other animal our food. When humans eat unnatural food it tends to deposit in human cells as toxic garbage and these toxins destroys our immunity which leads to various health issues.

Our immune system is safeguarded by 4 parts:

1. White blood cells



T Lympocyte cells
 B Lympocyte cells
 Macro phase

There is a supply chain to this immune system through:

- 1. Enzymes
- 2. Good bacteria
- 3. Food fiber

Is natural and organic farming the same?

No, it isn't. Like human beings, plant bodies also have in-built immunity systems. It is to be noted that plants and human beings have similar intestinal systems. All activities that exist in human bodies exist in plant bodies too. As per Indian philosophy, every living body requires 5 elements for its existence. Minerals taken up by plants from the soil, gets into the human system when we consume plants. Water granted by way of monsoons enters the soil and ultimately enters our human systems. The solar energy is the 3rd major element which is granted by the Sun. 12.5 kcal solar energy is conserved in 1 sq. ft. leaf surface area in one day. We intake this as well when we consume plants. CO2 is taken in from the air by the leaves owing to photosynthesis. The cosmic energy comes in from the cosmos. These are all bestowed upon us by God. All living beings are hence



constituted by these 5 elements, which in turn is constituted by 108 elements. 108 elements are divided into 4 groups:

Soil is Annapurna, an ocean of nutrients! The nutrients get transferred to plants through roots by help of microorganisms. Almost 70% of the atmosphere consists of Nitrogen, which is taken by nitrogen-fixing bacteria, which is supplied to plants through soil. This is again a natural process. All this is evidence to the fact that we do not need any chemical fertilizer, manure, etc. that needs to be added to the soil. Per my theory, none of the manure or fertilizer is any plant body's food. These are wrong claims made by the agricultural universities and organic farming followers. Nitrogen fixing bacteria exists in the dung of the desi cows.

Then, there are 3 forms of phosphate monovalent ortho-calcium-phosphate, divalent ortho-calcium-phosphate and trivalent ortho-calcium-phosphate. Plant roots need monovalent phos-



phate, which is not present in the soil. It cannot take in the other two forms of phosphate. Microorganism's species that are phosphate solubilizing bacteria convert divalent and trivalent into monovalent and make it available for plants. Potassium exists in the soil in surplus. However, it exists in the form of multi particle but the root needs it in single particle. This conversion is also done by microorganisms.

Desi cow dung is rich in these microorganisms. This clearly means God has given the duty of feeding plants with the required nutrients to microorganisms. God has not given any role to human beings to interfere in the growth and development of plant bodies. Everything exists in a balance. All these chemical fertilizers and organic manure and fertilizers etc. is highly unacceptable by plants. Hence, it is all deposited in the 60L crore cells of plant bodies as toxic garbage which destroys immunity of plant bodies and hence our immunity systems as well.

Even organic cultivation is not good enough?

For example, if you eat sugar it doesn't get accepted by the human body because it is processed food as there is chemical intervention in it and human body only accepts naturally-grown sugar cane juice. If you prepare jaggery with this sugar cane juice by use of lime then human body accepts it because it is a natural produce. This jaggery doesn't pose any side effects either. The unaccepted food gets deposited in the human cells as toxic garbage, which kills immunity.

Oils manufactured in wooden oil mills without mixing any chemicals is edible

and acceptable by our bodies. Refined oils on the other hand is processed by use of many chemicals which is unacceptable for our human body.

Likewise, any artificial product does its part in hurting our immunity system.

Even organically grown food is not natural.

If you observe nature, you see that even among animals, the young ones of one animal never feeds on the milk of another. This rule applies to human beings as well. We are only supposed to breast feed for milk when we are a child. We don't have the authority to feed on animal milk. Hence, all duties, actions and roles are specifically described by the divine.

Today the microorganisms are not present in the soil because we have killed them with the application of organically produced manure, vermicomposting, fertilizers etc. They have in them many things in them, which are poisonous for the microorganisms. So, just like chemicals, organic fertilizers are equally harmful.

To conclude, we are not to interfere with nature; it is against the will of God!

Hence, my philosophy of farming is termed Spiritual Farming.

How would you comment on the horticulture produces from where we expect a high yield?

In forests, there are huge trees with uncountable export-quality fruits where there is no human intervention. You test the leaves of these trees in any laboratory and you will find out that these trees are not deficit of any kind of nutrients. Whereas, in human-made orchards, among all the yield you get, there is so much of waste produce as well. Hence, the miracle of nature can be realized only with no human intervention.

What is your take on training trees to have their canopies in a particular manner?

I think agricultural universities are misguiding farmers and governments. They say that this is to get more yield. This is wrong at the very foundation. They say that plants compete with each other for nutrients. That is baseless argument. Plants do not compete with each other for nutrients. They only compete for solar energy and moisture.

In the forest there is a 5-level model - you have huge trees, medium trees, bushes, plants and creepers. All these produces fruits in abundance with no competition whatsoever. This is the model that we should also follow. This can fetch farmers a minimum of Rs 3L per year from 1 acre after 3 years and Rs 6L per year after 6 years. It is trusting God and reaping benefits.

Do you give practical training of your methods anywhere?

Yes! We have workshops getting posted on YouTube every Sunday morning. You get a live video at 7:30am - 10:30am in Hindi and 5:30pm - 8:30pm in English. You can download those videos and see it at any time. These workshops provides all kinds of information about Subhash Palekar Natural Farming.

I am now writing newly updated books, which will be published in



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multiple Indian languages. It will be out by December. Then, there are field visit programs that you can be part of. We declare the dates on YouTube, WhatsApp groups etc. My WA number is 9850352745. You can include me in your farmer groups and we can have daily discussions about this methodology of farming.

Post Corona crisis, I will hold workshops across India, which you can be a part of. We can send you invitations.

What do we do when there are pests and insect attacks?

You can control the nutrient but not the water and environment. All poisons enter the plant body through water. But we do have our remedies through which things can be brought under control. But these remedies are not ready made. You need to prepare them at your place and use them as required. With these home-prepared remedies, mulching etc. you can be sure to keep away all insect and disease attacks from your farm.

Can your concept of farming make India a food-surplus country in a sustainable manner?

Yes, 100%. Our population today is 135 Cr. We are producing 26cr metric tonnes of food and we have only 35 cr acre land under cultivation. It is estimated that in 2050, our population will be about 160 Cr. Hence, by the time we need our production to double. Current chemical and organic farming is set on a decline when it comes to production. But switching to natural farming will make you witness a miracle in the first year itself. Food crisis can be solved only through Subhash Palekar Natural Farming. If there are other techniques that come in as pure, we will accept. But as of today, there are no such technologies across the globe which can sustain the future generation.

You are in the government committee to double farmers' incomes. What is the progress in that space?

I am not in any committee. We do not want anything from any government. I am giving free service to State and Central governments.

During the last election to parliament, Modiji promised that if he got reelected he ensured double income for farmers. He thought that government of India is pouring money to research institutions etc. and trusted that they will come up with a sustainable and guaranteed technology. But none of

them succeeded in that mission. Then, the Government of India began to check out if there is any such viable technology registered in India. Finally, they realized only Subhash Palekar natural Farming is sustainable with a capacity to solve many issues like global warming, farmer suicides, cease urban migration etc.

Can we stand up to the global food security challenges being an agricultural-strong country?

Yes, absolutely! I have visited Africa and seen that there are huge amounts of fertile land lying uncultivated. In fact, we can utilize all such fertile lands across the globe and bring it under Subhash Palekar Natural Farming. Food crisis will definitely get solved using this method. But, it is most essential to control the population as well. Today the global population is 750 Cr. It is estimated that within 25 years it will shoot up to 900 Cr. If population is not controlled, we can never strike a balance. We cannot cut down forest land and set it up for cultivated land because that will be a huge disaster. Our earth needs 33% forest land for sustaining the environment.

Do you approve tissue-culture plants?

No, I do not approve anything that is

not natural. Honestly, local banana production gives more produce than tissue-culture banana. We are thoroughly against tissue culture. In that case, we can all take tissues from our bodies and create children in laboratories. There is no need of families or parents. Tissue culture is a demon technology.

Please tell us how to prepare jeevamruth at home.

It is a long process. Take 200 litres of water and add 5-10 litres of desi cow urine, 10kg local cow dung. Then prepare the slurry of 1 kg jaggery in a small quantity of water and add this to the above mixture. Take a small quantity of this water, add 1kg of pulses flour and stir it in well to dissolve. Add



this solution to the main mix. Take handful of field soil and add it as a bioculture. Stir it well and cover with a gunny bag and leave it for 48 hours for fermentation. It should not be exposed to sunlight or rain. Morning and evening stir it for 1 minute. After 48 hours the jeevamrutha is done. You can

use 200-400 litres of jeevamrutha per acre every 15 days. It gives you fantastic results. You have to also spray jeevamruth as a food spray on the standing crop by mixing 2 litres of jeevamruth in 100 litres of water. After 15 days, mix 3litres of jeevamruth in 100 litres of water and spray. After another 15 days, spray a mix of 5 litres of jeevamruth in 100 litres of water and so on and so forth. The results are fantastic.

Will farmers have to deal with weeds in natural farming?

Weeds do not come uninvited into your farm. Weeds come because of urea. Urea not just promotes growth of plants, it helps weeds as well. Hence, stick to natural methods.

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Rafesh Wan

Farmer, Maharashtra

ith evolution, we understand that we know lesser and lesser of the power of the soil. With Saguna Rice Technique for instance, gone are the days when paddy required clayey and flood irrigated lands.

According to Mr.Rajesh Wani, a Maharashtrian farmer who has adopted this technique, "I admit that in the first year it was slightly difficult but it has been a great blessing thereafter. The cost of production goes drastically low by adopting this technique. It drops by about 40%. This in itself is a great benefit to farmers. It also needs very less labor intervention. The best part of this technique is that you only need to cultivate the land the first year and then you do not need to redo the process for the next 15 years."

This innovative methodology, which was developed by a farmer named Mr.Chandrashekar Badsavle, promotes intercropping in rice fields as well. This technique empoys dry lands for rice cultivation, just like other plants. Absence of puddling and transplanting of rice makes it possible for farmers to be hassle-free about the erratic behavior of rain. Similarly if rain vanishes for few days during crop season it doesn't lead to cracking of land or 'crop kill' immediately. Even floods, according to Mr.Rajesh, doesn't seem to harm the crop.

Says Mr.Rajesh, "When Mr.Badsavle first told us about this method, we couldn't believe it without seeing it. 8 farmers from our district went to visit the farm where he had implemented this method and we realised how effective the method is and the farmers review in that area was fantastic. Today we have developed 4000 acres in our area using the Saguna rice technology."

This technology can be adopted by any farmer in any state. It improves the

soil conditions of that area, improves production and brings down the cost of production by at least 40%. In future, we are trying to incorporate technology too. We also get our produce with not much waiting period which is also something that fetches us good price in the market. Another factor is usually rice is cultivated in clavey soil which can get quite messy for the farmers involved. But since this technology helps grow rice on dry land, it is a great advantage. Your soil needs to be managed well before the onset of monsoons and keep things ready. The best part is during summer, you can grow other crops on your land. We have grown moong dal, onions, vegetables, etc. Also, this method keeps your crops very sturdy even in harsh climatic conditions. Our crop has withstood floods really well. I recommend start and check out this technique on a small piece of land and work your way up. We are always there for any kind of help or support that is required.

Which variety of rice did you plant and what profit did you make?

This is Parvati Sut. The duration of the crop is 150 days. It is fine variety and extremely soft and tasty. It is amazing for special preparations like biriyani etc. or even for simple steamed rice. We have an organic certification for our crop as well.

Do you face pest attack?

We do face pests. We use organic inputs like neemastra and jeevamruth so that such things are in control.

How much does this variety sell for?

We sell it for about Rs 80-90 per kg.

Can we place an order for this product from anywhere?

If it is a small quantity we can courier it across. If it is of higher quantity we will need to make it into packages of 10kgs each and send it across.

Do you know where else this variety is grown in India?

It is grown in a few other districts of Maharashtra.

Is there awareness about this technique within the farming community?

About 10,000 farmers use this technology today. The awareness is hence, growing.

Which university or research institution instituted this technique?

In Chandapur district of Maharashtra, there is a farmer who developed this technique. He is Chandrashekar Bhasavle. He is highly popular.

What is the difference between SRI and SRT?

SRI involves transplanting which is not so with SRT.

What is your future plan?

We aim at more than 70% farmers adopting this technology because of its enormous benefits. We want to set up an organization to improve the marketing as well.

What is your production per acre? It is about 22 quintal.

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Venkata Narasimha Raju

Managing Director Coldspace Agrotech India Pvt Ltd, Hyderabad



Coldspace Agrotech India Pvt Ltd has been synonymous to fruit ripening in the agricultural world.

According to Managing Director, Mr. Venkata Narasimha Raju, "We are the leaders in the market when it comes to mango ripening. In the past 7 years, approx. 30,000 tonnes of fruits have been ripened at our establishment."

Traditionally, ripening was carried out by covering the fruits using paddy straw, smoking, etc. Off late, carbide came into picture until its bad effects surfaced. Nowadays the buzzword is ethylene ripening. Ethylene acts as a catalyst to ripen fruits. Upon attaining 70% maturity of the fruit on the tree, the tree imparts ethylene oxide into the fruit. This later helps in the ripening of the fruit. This is the concept we follow in ethylene ripening. Ethylene ripening has been adopted for over 3 decades in developed countries. WHO and FAO has certified this as a method of ripening. It is permitted for even organic farmers. It is thoroughly natural and harmless.

Using ethylene is safe and economical. This method helps in control the temperature in the fruits to 20 degree C unlike in traditional methods where the temperature shoots up to over 50 degrees C. In the traditional method there is drastic weight loss of almost 15%-20% in the fruit. This heat leads to rotting of fruits and results in 20-30% loss in produce. In comparison to this, losses are minimal with the usage of ethylene ripening.

"We ripen fruits in a pressurized ripening chamber. That is, if there are 20 tonnes of fruits in a ripening chamber, ethylene is passed through to ensure that each and every fruit gets in contact with it without any interference of CO2. All fruits are equally treated here. Only in such conditions will the fruit quality sustain. Our market share in the past 7 years has been on the rise.

In addition to this, we have cold room facility as well. We store imported fruits and local banana etc. in it."

How does this help farmers?

Agriculture as a whole can be classified into 4 major pillars:

- 1. Production
- 2. Practice
- 3. Processing
- 4. Promoting

All these 4 pillars need to be given utmost importance. Farmers are of the thought process that the market should accept whatever they grow, which isn't a sustainable idea. They must understand the market preferences - color, size, taste, packing etc. of the fruit. This will fetch them good price of their produce. Wastage of crops is also a loss for the farmer even while he makes profit. To reduce wastage, the process must be observed right from the beginning, harvesting at the right time, packaging with care and transporting using infrastructure optimally. Absence of infrastructure will lead to all other processes getting rushed. To prevent losses, good infrastructure is necessary. Losses can be prevented by setting up an organized pattern.

How can use ensure optimum ripening?

If mango remains for an hour under the hot sun, its internal



temperature gets raised by 14 degree C. Once the internal temperature increases, there will be bubble-like formations internally. Hence we should not leave mangoes under the sun. Harvested mangoes should also not be left in the soil. It will get infected. Mangoes should not be put on dry leaves as well. Keep them on brown paper, cloth, jute / cotton bags. Fruits should be later layer-packed in crates. 3 layers are permissible and it should be perfectly graded. Imported fruits come with uniform, color, size - quality is top-notch. Price is dependent on the grade of the fruit.

Are there ways to improve the quality of fruits?

With simple practices we can improve the quality of fruits. For example, control of fruit fly. Fruit fly can be controlled using traps. From tree level itself, we have to follow the trap methods so as to avoid chemical sprays. Spraying fermented butter milk, 3 times - 15 days prior, 7 days prior and 1 day prior the harvest will control fungal diseases like Anthracnose by 90%. Fruits flies and other pests cause severe damage to mangoes. 20% losses occur due to mismanagement of pests. Instead of poisonous pesticides, we need to employ such harmless budget-friendly methods.

Fruit ripening guidelines strictly recommend to harvest the fruits at 70% maturity of the fruit. We use ripening techniques for ripening alone and not for adulteration. Commercially matured fruit will have an even yellow color flesh from centre to outwards. That is 70% maturity. Yellowing starts from near the seed and grows out to the ends. We ripen such matured fruits so as to ensure good taste. The matured fruit will have cheeks protruding outwards. Another parameter that determines the maturity of the fruit is its specific gravity. If you place the fruit in a bowl of water, it will settle to the bottom of the vessel and not float around. That is the fruit density exceeds the weight of the water.

We have all laboratory instruments that we need at our facility. We compare over 17 parameters before concluding the maturity of the fruit. Quality is prime in determining the price of the fruit and eligibility for export.

A case study was conducted by a foreign University in Brazil on mangoes. They recommended not to use ladder steps while climbing a tree but to only use the side frame. Holding the fruit after touching the ladder steps is one of the reasons for Anthracnose fungal attack in fruits.

How should ripening chambers be handled?

Our chamber is a specialized ripening chamber. We follow international standards and practices there. We maintain a 16-30 degree temperature in the chambers. Specific varieties require specific temperatures. People using economy ripening chambers follow low standards. That is useful only for banana in cool seasons, not mangoes.

What are the steps to be taken to create a mango orchard in

North India?

The first thing is always choose a matured fruit. Then do stem cutting. Never place the harvested fruits on soil or keep it under the sunlight. Make sure you do ethylene ripening and carefully transport the fruits. In Andhra, June - December they almost forget the garden. Dont give any nutrition to the trees at that time.

What is the best time to graft a mango tree?

Generally, when the tender leaves sprout out. That is the best time to graft. July, September and December, is when we see new leaves sprouting in Andhra Pradesh. Before the leaves open up from the bud stage is the right time to graft.

Mangoes sometimes get rotten within a week – how can we improve their shelf life?

By using 5% fermented butter milk 15 days, 7 days and the day prior to harvesting will improve the situation.

How to recognize when a fruit is ideally ripened?

Smoothness or firmness of the fruit shows that the fruit is ripened. 20 mg of CO2 gets released per hour per kg of fruit. That is the actual process of ripening. There are indicators present to measure the CO2 levels.

What is your take on ripening by dipping in potassium permanganate solutions?

For export quality fruits, dip the fruit in warm solution. Some trees are infected. Make sure that fermented butter milk is sprayed on such trees. If you opt to go for chemicals, there are many solutions available.

How can we prevent flower and fruit droppings?

I am not an expert in that area but temperature below 17 degrees is not good for mango pollination. High temperatures are fine.

How can I open a ripening centre?

Ripening requires a lot of skill. You may come and visit our ripening chambers at Hyderabad to get first hand knowledge. We can offer guidance.

What is the cold chain involvement in the entire process?

Cold chain reduces the losses by nearly 15% - 20%. It helps is keeping the weight of the mango intact and hence prevents rotting. Hence it is a highly recommended process.

Does artificial ripening alter the taste of the fruit?

No, it doesn't. It doesn't because we follow the commercial maturity process. Fruit usually gets 100% maturity on the tree. We pluck it at 70% maturity. Hence, it is very close to the natural method of ripening. We cannot compete with nature. But we stay close.

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Dr. R S Minhas

Chairman, Stone Fruit Growers Association of India

In addition to being the Chairman of Stone Fruit Growers Association, Dr.R S Minhas is also heading an Organization working for small and marginal farmers of Himalayan region in the field of organic farming i.e. Himalayan Organization for Organic Agri-Products Research & Development (HIMOARD) as Project Director.He has experience in traditional grains, fruits, wild fruits and Medicinal herbs grown in hilly area& its nutrition and uses in day to day life and to maintaincomplete health.



Stone fruit is cultivated in Northern, Northeastern and southern hilly region of India. It is mostly cultivated in Himachal Pradesh, Jammu & Kashmir, Uttarakhand and some north eastern states like Sikkim as well as some areas of Arunachal Pradesh.

"We deal with variety of temperate fruits like Peach, Plum, Apricot, Almond, Cherry, Walnut, Hazelnut, Pecan-nut, Chest-nut and Pine-nut. We grow different varieties of Peaches like Sun haven, Red haven, July Alberta, Red Giant. July Alberta is a late variety and fruits of this variety bears most in late April, itis available in the market between July and August. We also grow a variety of plums like Santa Rosa, Black Amber, Red Beauty, etc. Apart from plums, we are also growing apricots. Apricot varieties are like Kaisha, Nugget, Suffaida, Charmagaz and Shakarpara. Charmagaz and Shakarpara are the processing varieties and sold as Dry Apricot. It is grown in the high altitude area specially where there is dry temperate zone, where there is only snow and no rains. We also grow almonds - Ne Plus Ultra, Nonpareil, Drake, etc." Said Dr.Minhas Chairman HIMOARD. Currently, they supply to Delhi and Chandigarh market. They are also trying to send fruits to Chennai, Pune and Mumbai too.

ow do you go about stone fruits cultivation? These are perennial temperate fruits and initially grown in nursery and later on transplanted in the field. The cultivation practices are same as other fruits; accept transplantation is done in winter. Pruning and training is necessary in winter for good and quality fruit production, when plant is in dormancy. Stone fruits are very less diseases and pest problem due to low temperature and relative humidity, short duration from flowering to harvesting and in fruit development stage. Stone fruits are mostly, by default organic. The Stone Fruits flowers in the month of March and harvested in May and mostly reaches in the market in the early May. We are practicing organic farming since last many decades and got certification from 2003 onward for Indian as well as International standards. As per Marketing of Stone Fruits is concerned we are supplying it to nearby market due to its high perishable and lesser self-life. We are trying to explore distinct market in other part of India with help of latest transportation techniques like cool chain network etc.

Can these fruits be cultivated in places like Bangalore?

Only few spp. Like some varieties plum and peaches can be cultivated but not all due to its high chilling requirements (means hours required below 7digree c). We tried few varieties of Almond, Peaches and Plum in Western Ghats and they responded very well. So association is motivating farmers to cultivate stone fruits in cold areas so that it can help them to increase their income and fulfill market demand simultaneously. Stone fruits already cultivated in Neelgri hills and kodaiknal area of southern India. The only difference is fruiting season is little differ from Northern India. it can be viable alternate to increase farmer income for the growers of WesternGhats and Neelgri hills.

Are you interested in venturing into doing sales in Southern India?

Of course, yes. We are also looking for anopportunity to explore marketing of our produce in southern parts of India, infect we are already in dry fruit (Almond, Walnut, Hazelnut, Pinenut and Pecannut) marketing in south India, we welcome if some good proposal will come and we will consider it on priority.

What is the harvesting period for stone fruits?

Stone fruits harvesting starts from May onward till July 1st week and dry fruits is harvesting starts from September and ends in November. Few varieties of peach is harvested in July August.

How is the sorting and grading of fruits done?

We sort and grade fruit in our farm manually. After sorting and grading fruits packed in corrugated boxes before send to the market.

Are there varieties of stone fruits that can be grown in Chennai?

As I said in last to last question only few low chill varieties of



peaches and plum can be cultivated in the home and kitchen garden but not for commercial purpose. But, in winters it requires a minimum temperature below 7 degrees centigrade.

What kind of consultation do you give for cultivation of stone fruits?

We are providing consultancy in the field of production technology organic certification disease and pest problem and their solution, grading and packaging and marketing of stone fruits and other fruits vegetable, flowers, cereal, pulses traditional grains and medicinal herbs.

As a president of the Stone fruit growers' association, what exactly are the measures that are being taken to promote the stone fruit cultivation?

We are importing latest germplasm from advance stone fruit growing countries and also getting consultation from USDA and other institution of repute in India and across the world about latest technology in the field of production, marketing and processing as well. We will be exploring the cultivation of stone fruit across the country, where suitable condition is available. We are also exploring latest technique in the field of cool chain network for transportation our produce to distinct market.

Any chances for value added products from stone fruits?

We are already in processing of stone fruits (Jam, Cider and Apricot and walnut oil). We also working on good and attractive packing by which fruit can be transported safely. In this venture some good and affective proposal will be welcomed.

Would you be open to providing the technology required for value addition for those interested?

Yes, of course we are trying our label best and regularly in touch with agriculture institution across the country, if some other agency is interested to deliver they are also welcomed.

Can these stone fruits be cultivated under greenhouse conditions?

No it's not possible due to its vigorous size. It can be possible in near future, when dwarf root stock will came into existence.

What can you tell us about avocados?

An avocado is a bright green fruit with a large pit and dark leathery skin. They're also known as alligator pears or butter fruit. Avocados are a favorite of the produce section. They're the go-to ingredient for guacamole dips. And they're turning up in everything from salads and wraps to smoothies and even brownies. So what, exactly, makes this pear-shaped berry (yes, that's right!) such a super food.

Avocados have a lot of calories. The recommended serving size is smaller than you'd expect: 1/3 of a medium avocado (50 grams or 1.7 ounces). One ounce has 50 calories. Avocados are high in fat. But its monounsaturated fat, which is a good fat that helps lower bad cholesterol, as long as you eat them in moderation. It is good for heart patients, diabetics etc. Doctor advises people with heart ailments to have this fruit.

Avocados are grown in those areas where humidity is more



than 70 to 80%, since this condition is there in Jharkhand I don't think there is a problem.

How is the demand for Indian stone fruits in the International Market?

Potential in International market is huge but due to its less self life and highly perishable it cannot be reached everywhere. Even thoughStone fruits have very less shelf life and that is why we have not tried it in the international market as yet. We did try on a small scale and sent some to Pakistan, Shri Lanka Middle East and some to gulf country and there was good response, but transportation is a very big issue for these fruits.

Give us an insight about growing traditional grain on the hills.

Agriculture is the major source of livelihood and the food basket is characterized by traditionally grown cereal crops. Rearing livestock goes parallel and it supports agricultural practices. Similarly, forest contributes to agriculture and livestock activities and thus, agriculture, livestock and forests form an integral part in economic development. Economy of the region is highly dependent on the limited arable land and about 59 per cent workforce is involved in agricultural practices The Himalayas have rich bio-resources consisting of many indigenous varieties of cereals such as rice, maize, finger millet, wheat, buckwheat, barley, sorghum, pearl millet. There are broadly five agro-climatic zones in the Himalavan region. Each zone has its own characteristics and subsequently, the farming system varies. The first zones comprise of the high altitude temperate climate (humid to arid), where annual rainfall is less then 1200mm. Jammu and Kashmir



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including Leh- Ladakh falls under this zone, is very famous for the cultivation of temperate fruits like Apricot, Almond and few varieties of walnut. The second zone characterizes hill temperate to cold and frigid climate (humid to subhumid), varies according to altitudes. Annual rainfall is 1200 to 1800 mm. Himachal Pradesh and Uttarakhand states are located in this zone. The economy is largely dependent on subsistence terraced cereal farming including millets and cultivation of developed temperate fruits. These areas are mostly known for stone fruits cultivation. We grow different kinds of millets like Proso millet/ foxtail millet, finger millet and several varieties of amaranth. We are growing 3 traditional varieties of wheat and buckwheat. From my personal experience millets is good for health due to its nutritional value.

I am diabetic since the last 17 years and was on insulin since last 6 years. I am managing my diabetes without insulin and medicines with the help of traditional grains grown here since last two years.

I turned to millets and wheat growing in this area for my diet. As a result, my diabetes as well as heart problem is completely under control. My lipiddemic index is also in good condition or perfect.

Where in Shimla is your office located?

It is situated in Rampur, 140 Kms. from Shimla on Hindustan Tibet National Highway no 5. The institute is HI-MOARD Himalayan organization for Organic Agri-Products Research and Development. I am also working as Project Director in this institute.

My Contact Details Dr R.S. Minhas 9418034928 and 7018909498 Email: - himoard@gmail.com

The stone fruit is now being popularized in and around Bangalore by the Indian Institute of Agricultural Research and also there is a well experienced doctor at GKVK who is getting these exotic fruits in Bangalore and trying to popularize it. Perhaps, we can get some varieties from your side and use it in Bangalore.

Dr. A. B. Rema Shree

Director, Spices Board, Kochi



pices Board (Spices ?) needs no introduction. It has stood tall for years at hand and is a matter of great pride for India. The Indian spices are one of the unique attributes that we as a country offer to the world. Our spices make our food special and outstanding. Spices Board does research, development and regulation of domestic market of small and large cardamom, post-harvest improvement of all spices, promotion of organic production, processing and certification of spices, development of spices in North Eastern States and provision of analytical services for spices through the network of quality evaluation laboratories and export promotion of all spices through support for infrastructure development, brand promotion, research and development etc. In her detailed session on the activities of the Spices Board India, Director, Dr. A. B. Rema Shree said, "we provide holistic support to all stakeholders in the supply chain of spices. We are the global leader - the largest producer, consumer and exporter of spices in the world." Spices contribute towards 10% of India's agri exports. We export around 225 products including value-added products to over 185 destinations. We have over 6800 registered spice exporters, of which 689 are manufacturer exporters and the rest are merchant exporters.

The main export locations are USA, China, Middle East and South East Asia. All over India, the Board is looking forward for production of quality planting material through certified nurseries because of the dearth of adequate capacity to produce and supply quality planting materials in large quantities through agricultural or research institutes. So, the Board promotes certified nurseries to aid farmers.

The Board also promotes integrated pest management (IPM) with use of label-claimed pesticides and good agricultural practices. Export ban happens with the presence of large quantities of pesticide residue. Presence of pesticide residue is a matter of concern in domestic market too. In some cases, 100 per cent organic cultivation is not possible; for example, cardamom. In such cases, **Integrated Pest Management Practices** are adopted. The Board, also promote webinars, etc for market linkage, trainings and information dissemination. Spices Board promotes aggregated agriculture, FPOs etc. It is expected that, in future grant of subsidies also will get focused on clusters. Group approach is considered as the future of agriculture. The Board is highly committed to support all kinds of networking among farmers at national and international level. The Board has a proactive approach when it comes to food safety.

Farmers in the rural area rarely have no direct link with exporters or traders. To avoid middle men and to help farmers to fetch better prices, the Board organizes buyer-seller meets.

Spices Board has established eight spices parks. We invite entrepreneurs to set up their spice processing units in these parks. In all these spices parks the Board provides space for infrastructure development of spice processing and value addition. The Board also has eight quality evaluation laboratories for testing the quality of spices and certification for export.

The Board also undertakes a multitude of activities like trainings to FPO members, linkage of state departments, award of dealer license for trade in cardamom, monitoring supply chain, dissemination of regional market price of spices weekly, and offering support for various brand and trade promotion activities like participation in domestic and international trade fairs; quality testing; and spice clinic for effective monitoring plant diseases and pest attacks at farmer's field.

Geographical Indication certification is awarded to 20 spices from India and the Board also provides assistance to brand and promote these GI spices in international market.

Are there any specific pesticides used for the cultivation of spices?

In our IPM schedule, we insist that farmers use label-claimed pesticides that are approved by the Central Insecticide Board and Registration Committee. But, at the field, farmers use different types of pesticides which is quite not prescribed.

To which countries are chilies exported currently?

We export dry chillies to USA, China, Vietnam, Middle East countries, Germany, etc.

Do we have advisory boards at Hyderabad to advise us on spice



cultivation?

We have one in Hyderabad in the Horticulture department. We also have two regional offices at Nizamabad and Warangal. Spices Board's Hyderabad office can be contacted for any advice and if interested, we can include you in our advisory sessions / emails. We can even do these for farmer groups if you form one.

Is Telangana soil suitable for the cultivation of cloves, cardamom etc.?

Telangana is best suited for chilli and turmeric. There has not been any trial for cloves and other spices as yet.

What is the supply-demand percentage difference for spices abroad when compared to India?

India produces about 9.8 Million tonnes of spices annually, of which the export is 12 per cent and the domestic consumption is 88 per cent. Having said that, during COVID period, there was an increased demand for immunity boosting spices like turmeric. Nowadays, people use spices not just to add flavor to their food but also for its wellness and medicinal qualities. As per our statistics, the export-demand for spices is on the rise.

Do you support in extraction of garlic oil?

We have spice parks at various locations. If you visit the ones nearest to your place, officials of the Board will help you with any entrepreneurial unit you wish to start. You can email me with any specific questions you may have. I can steer you in the right direction.

> Please advise the best spice that can be grown in the hilly regions between Karnataka and Tamil



Nadu, near the Kaveri belt.

I would encourage you to send me an email with all the specifics of that region especially the kind of rainfall you receive along with other parameters like soil, climatic conditions etc. I will make sure you get the right guidance. We have offices in Bangalore, Tamil Nadu and Madikeri as well.

Can spices be grown in Kavalli, Nellore district of Andhra Pradesh?

It is best suitable for chilly. Nowadays, black pepper is also been introduced in certain areas of Andhra Pradesh. It all depends the soil type, climatic conditions and rainfall in the area. Write to us with specifics so that we can guide you in the right manner.

Are there specific seed varieties that are used to cultivate spices?

Absolutely! Our nurseries promote good variety planting materials which are disease resistant and capable of giving high yields. We promote quality agriculture. All state agricultural universities and / or research institute released varieties will be highly beneficial to go ahead with. Before moving to any cultivation, farmers should give lot of importance to seed material. For example, black pepper has around 99 varieties out of which we recommend the drought and disease tolerant varieties suitable for the concerned area. Likewise, for all spices there are many varieties to choose from. The trick is in choosing the best one suited for your area.

What are the future aspirations of the Spices Board?

Looking at our way forward, we aspire to:

1. Follow the new normal - understand and educate how to cope with the current COVID situation

2. Address issues of supply chain prior to the next harvest

3. Maximize our efforts to reach out to small and marginal farmers

4. Support FPOs to become more empowered and add more value

5. To provide holistic support

6. Focus on quality and productivity.

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Biju Narayanan

Pepper Cultivator, Kannur, Kerala

hat is the Vietnam Model? The Vietnamese took to many cost

effective measures which we could adopt with a few subtle changes. They could cultivate 4 times more than what we could on one acre of land.

This is achieved through high density farming - 8ft x 8ft which is about 800 plants in one acre. In addition they use high-tech farming, i.e, adoption of irrigation with fertigation, top shoot seedlings etc. They kept the plant height to about 12ft.

This is a very cost effective method and also eliminates the need for skilled workers during harvest. They also used non-living supporters like dead trees and concrete beams. This way they ensure that all of the fertilizers are used up only by pepper plants.

Is this model sustainable in India?

Now when adopting a technology from

Mr Biju Narayanan is a mechanical engineer turned agriculturist who today is the proud owner of Ullikkal Agro Farms. Ullikal Agro Farms stands tall with different varieties of a crop regally termed as black gold pepper!

"My main area of expertise is cash crops like cashew, pepper, arecanut, coconut, etc. I also grow a large variety of fruits and spices. Among the spices my specialisation is pepper farming," says Mr Biju.

Ullikkal Farms is host to 54 varieties of pepper - one of the largest varieties of pepper cultivation in India. "Farming is highly profitable and gives great honor if you do it mindfully and with passion. Recently, I had a chance to represent India at the IPC (International Pepper Community)" according to Mr Biju.

Mr Biju has always been on the search to devise a methodology to improve his profits and this journey consumed everything from the history to the best practices one should adopt for cultivating pepper.

Giving an insight into this spices' history, Mr Biju says, "Pepper cultivation began gaining visibility by 3rd century BC. Our ancestors began this practice of cultivating pepper a very long time ago. In Kerala, government controlled the spices trading during the Samoothiri rule. All foreigners coming to our country were greedy towards pepper. Romans are said to have emptied the pepper treasury. Pepper, also known as the Black Gold, was traded for plants like rubber and cashew. By the time India got independence, pepper cultivation spread across to Karnataka and Tamil Nadu as well. In 1961, the articificially created pepper variety named Panniyoor-1 created quite a revolution in agriculture. Paniyoor-1 almost erased traditional varieties of pepper but it met its demise along with other pepper varieties with the onset of Quick Wilt in the 1980s. This led to farmers withdrawing from pepper cultivation. Having said that, seedlings were taken from India and cultivated in Vietnam, Cambodia, Sri Lanka etc. Soon, Vietnam soared to the position of the highest pepper producing country." elsewhere, it is important to tweak it for the conditions we have in our region. In my plantation:

1. I adopted the 8ft x 8ft methodology

2. I used Jackfruit and sheemakonna as supporters. That is one pit, I have a jackfruit plant, a sheemakonna plant and pepper seedlings. I also used asbestos pipes with holes. Asbestos pipes are highly cost effective pipes.

3. I went for drip irrigation with fertigation

4. I followed the Vietnamese model of shortening pepper plants and keeping them at 12ft. This is very useful in keeping the labor cost low.

5. I use grinding machines to obtain good quality pepper.

You can check out my YouTube channel - Biju's Pepper Garden: https://www. youtube.com/watch?v=l-pM8WpFBhk to see my pepper farm.

Some important points you must note are:

• Try cultivating more varieties because each variety has its own merits and demerits. To raise pepper profitably, focus on getting maximum yield under any adverse conditions.

For example, the Panniyoor - 1 is a high yielding variety but it yields only once in 2 years and it doesn't grow in shady areas and succumbs to quick wilt.

• For larger plantations, include at least 4 varieties to ensure an average yield per year.

• Your choice of land is of course, a prime factor. Choose varieties best suited for the land type.

o For shady land, varieties like Vijay, Koombukkal, P5, P2 etc.

o For dry areas: P8 and Manjamunda o For rocky areas: Kalluvalli, Karimndi etc.

• Native varieties that we ignore often have their own demand in the international market. Ayampiri, Kalluvalli etc are very much sought after varieties among exporters. Tellicherry Extra Garbled Pepper (TEGP) is said to have the most qualitative value in the international market. TEGP was taken away by foreigners from Thalassery,



Kerala and today we can't find this variety in our country. It has a value of about Rs 22000/kg in the international market vs an average cost of Rs 400/- per kg.

• Use of machines, like pepper grinders, and plastic covered mulching can increase pepper quality.

What about native varieties?

It is a great opportunity to work towards bringing back native varieties. I was once approached by foreign companies for native peppers. They had a minimum requirement of at least 500kg per variety which was something I couldn't meet. There were willing to double the price as well. That is the potential of this market. So, if things are done right, success will surely be yours!

What kind of climate - temperature, rainfall altitude etc. - for pepper cultivation?

Pepper grows well at an altitude between 1000 ft - 3000 ft above sea level. The temperature of the place should be between 27 degrees - 35 degrees Celsius.

Can it be grown as an intercrop along with cashew?

Yes, you can. In my YouTube channel. You can see how effective it is to have cashew and pepper as intercrops.

How good is Thekkan pepper - can it be grown in hot temperatures?

Thekkan variety is more or less a fancy variety. You may get a little more outcome from Jeeramundi. In my experience these are not great varieties. It does well in our Wayanadu plantation but not in Kannur. This is perhaps due to the temperature and altitude difference. These varieties are better grown at high altitudes and low temperatures.

Can we grow pepper in areas that have 35 degrees to 40 degree temperatures?

Temperature should be up to 35 degrees Celsius. In my place, temperatures can soar to 37 degrees and 38 degrees as well. But that is not great for pepper if it is a constant scenario. Ideal temperature is 27 degrees - 35 degrees. Varieties like P8 and Manjamunda is better for hotter weather conditions.

Can we grow pepper with artificial support?

Yes, you can. Very shortly, I will be posting a video in which I will show how to use asbestos for pepper cultivation. That is a cost effective method. You can also see how to employ shady nets. Usage of shady nets is expensive but it is effective.

Do you supply plant seedlings?

Yes, we can do that. Among the 58 varieties, about 29 varieties are commercially viable. I can give you planting material.

Which variety is best suited for Karnataka?

P8, Koombukal, Vijay and Manjamunda has shown good results at Chikamaglur, Shimoga and Ennapuram.

Can we grow these varieties organically in a poly house?

Yes, sure you can. I use organic manure on my farms.

How long does pepper take to yield if we go with open field cultivation along with cashew? That depends on the variety you grow. It is usually 15 months later that you begin

is usually 15 months later that you begin getting your yield.

What is the output one can expect from an acre of pepper cultivation?

You can get a minimum of 1 kg dry pepper from each plant after 4 years. After 6 years you begin getting 1.5 - 2 kg.

Can we visit your farm? Oh yes, you may.

What is the price of 1kg pepper in the international market and which are the countries that we can participate in trade?

The price per kg differs for each variety. The minimum requirement is 500kgs for export. Most of the European countries are good for export. The French company I deal with has branches in various European countries.

Can you supply pepper in bulk? Yes, of course.

Are there any bush varieties in pepper?

All pepper varieties have bush varieties as well. I have 18 varieties of bush peppers.

How can we solve fungal infection on pepper plants?

Following good agricultural practice will keep fungal infection at bay. You have to do a one year planning. Start from April - use dolomite or lime. I can give you detailed information if you send me an email.

What is the minimum price per kg in India for pepper?

Minimum price is about Rs.500 per kg.

Please talk about the native varieties of pepper in Karanataka?

Most Kerala varieties are good for cultivation in Coorg as well. The native varieties like manjamunda, karimundi and kalluvalli are available in Karanataka.

What is your opinion about the Brazil variety?

Our Indian variety is much better than Brazil varieties. It is more profitable also. Foreign countries come to India for good quality pepper seedlings?

You had suggested using jackfruit as a supporting material. Jackfruit requires a spacing of 24x24; so, how do you manage the jackfruit plants?

The jackfruit plants' branches are cut to suit the spacing for pepper. Watch my YouTube video or call me to understand how to do this, better.

CONTACT : Mr Biju Narayanan, Email: bijuulickal@gmail.com, Phone: 919447447694

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Ratnakar Rai & Dr. Sangeeta Pant

Director, Poorna Agrisystems



oorna Agrisystems is an agricultural technology company founded by Mr. Ratanakr Rai and Dr. Sangeeta Pant. Mr Ratnakar is specialized in hydroponics and controlled-environment agriculture and Dr. Sangeeta Pant is specialized in micropropagation and hybrid systems of plant production.

When asked for a brief introduction about himself, Mr.Ratnakar Rai, Director at Poorna Agrisystems says, "I am a trained horticulturist from the US. I have spent about 20 years there in the field of hydroponics, doing projects and working as a consultant. I am in India now to help this industry and ensure it is in the right track and people benefit out of it." We also ran commercial operations.

When asked for a brief introduction about herself, Dr. Sangeeta Pant, Director at Poorna Agrisystems says I am specialized in plants production through Plant Tissue Culture technology and in controlled environmental conditions with over 10 years experience.Worked with PepsiCo and one of the pioneer Greenhouse company

Hydroponics is about growing plants using nutrient solutions, without soil. The media for nutrient absorption is largely water. It is a highly scientific approach wherein all the nutrients are provided

externally. The whole procedure is controlled and monitored, which is a huge advantage in comparison to open field agriculture because the soil is much too complex and dynamic. Hydroponics is all about precise calculations and management of resources. Hydroponics reduces labor dependency as well. For example, in open field cultivation harvesting crops in an acre of land would mean hiring 5-15 people. In hydroponics you can get this done with 3 people. It is much more simpler. Also, there is no hassle of weeds etc. Hydroponics enables higher yields per unit area.

Most of our population is moving towards the urban sector and there are some crops which are suited to be consumed fresh. Hydroponics is very much suited for urban and peri-urban conditions. Hence, it is gaining a lot of popularity. It can also be set up in villages with a population of 10000 people.

As a whole we have two categories – traditional agriculture complex and organics complex. Humanity has invested billions of dollars in the agriculture complex. Pesticide / insecticide factories etc. are the result of the agriculture complex. It has given us a lot of food security and lot of professionals.

The organic complex has gained much popularity in the last couple of years. But there is hardly any money getting invested in there - not even by the government. In the last couple of years we do see a rise in budget towards the organic complex but this in no way can be compared to the kind of attention the agriculture complex receives. So, it is left to be developed by the people and so not many professionals churn out here. It is being developed by amateurs.

Hydroponics adopts a midpath. In hydroponics we adopt knowledge base from both these complexes and develops an independent discipline. We try using organic inputs into hydroponics. We try managing pests in a very friendly manner. All the methodologies developed come from the agriculture complex.

What are some of things we should bear in mind before entering hydroponics?

There are a few things:

1. Be market driven - you need to choose the crop you want to grow based on market research. Without market research, things can turn out very sour and difficult. A successful hydroponic venture is about 60% research and 40% production. For example setting up a tomato unit in Delhi or Nasik which is a catchment area for tomatoes is not a great idea.

2. Understand your site - History of the land is of utmost importance. Some people set up expensive set ups but do not think about the access to such areas. Pay close attention to site selection. Take into consideration, distance to market, ease of operation and access, availability of electricity, water etc.

3. Labor management - a very important factor. We help train labor but managing them is your part of the deal.

4. The weather – Understanding weather patterns of the place where you desire to build your site is extremely important for building the right kind of structure.

5. Water quality - Hydroponics thrives in water quality. Water source should be analyzed for pathogen load and nutrient load. This will determine if the water needs any additional equipment to further optimize it for hydroponics.

The best water would be the city water but that can sometimes turn expensive. Second best would be tube wells. River water and rain water are good sources. Stagnant pond water would take a last resort stage.

6. Top notch budgeting and accounting - Record keeping should be given utmost importance. This is building your history base which will be highly beneficial for future forecasts making things simpler in the long run.

7. Hydroponic system - Hydroponics employs many types of systems. Sys-



tem should be chosen depending on the crop you wish to grow.

8. SWOT analysis - Perform a detailed SWOT analysis and share the observations with us in the initial stages so that we can help you delve deeper.

What are the different types of hydroponic systems?

There are many to choose from:

• NFT

* Most popular

* Highly suited for small-rooted crops - lettuce, herbs, strawberry etc.

* Suitable for cultivation immediately outside the city if you have clients that order fresh from you

* Advantage: resource conservation

• Vertical System (open air system)

* Highly suited for: strawberries, cabbage, peppers etc.

* Advantage: Plant population gets tripled per acre

Dutch Bucket System

* Highly suited for larger rooted crops tomatoes, cucumbers, capsicum, beans etc.

* Media-based system - The media here is highly inert.

* Advantage: As advantageous as the NFT but is a highly precise system. It requires in-depth horticulture understanding. Hence, there are risks involved too.

• Deep Water Culture (DWC)/ Raft/ Float System

* Highly suited for: unicropping - great for lettuce, greens, herbs.

* Advantage: Easy-to-operate but cannot grow multiple crops at the same time

Media Based System

*Highly suitable for: beginners

* Advantage: Simple system. Most people use cocoa peat instead of soil.

We use a little more lighter media with several amendments so that plants get optimum mechanical support and nutrients. It does very well for many crops.

- Ebb and Flow System
- * Uses inert media

* Highly suited for: ginger

Aquaponics

* An organic system that employs fish rearing and vegetable cultivation at the

same time.

* Myth: People think they can double their income by selling the fish and the vegetables and adopt this system. This is a myth. You have to focus on the fish or the plants. The main product fetches your income.

• Aeroponics

* Highly suitable for: potatoes and a wide range of vegetables

We, as a company, have modified a lot of potato farms into vegetable farms using this method. The cost is, however, very high.

What are the advantages and risks of hydroponics?

The advantages are:

• Plants can be grown anywhere

• better control over plant growth

• no loss of time

• use of very less nutrients and is water friendlv

• pest and disease is better controlled - no soilbased pests

• no issues like soil erosion to encounter

• it is an extensive agricultural practice

• you can have extensive crop seasons

The two major risks are market and production. Besides that:

• Need to train manpower - We do not have



skilled manpower who understand this exact process. Smart people can be trained very easily - no doubt. But we do need to train people.

• Capital intensive production system - it is a risk because of the money involved. Our projects do give a good ROI in the Delhi region also because we have market tie ups there. We try dealing with people at places where we can do the marketing for you so that this risk is minimalized.

• Disease control and management -Hydroponic production depends on certain seed and plant material which is developed for controlled environment conditions. In India we don't easily get those. Most of the time we use field varieties and employ them in green houses which is risky to a certain degree.

• Water quality - The recommendation is to test your water every 2-3 months. Ground water level keeps changing and so does the nutrient level in the water.



Testing facilities, however, is not readily exhaustible. Some people grow in pond water which may have too much of biological load and can infect the crop.

Hydroponics

What is the smallest recommended farm size viable for a hydroponics system and what is the investment required?

This depends on the type of hydroponic system and the area of cultivation. But generally, a simple green house will cost you around Rs.900 per sq mt. The fan and pad cooling system will be about Rs.1600 per sq mt.

The smallest site one should go for is at least a 1000 mts, but 1 acre would be really good though. 1 acre gives you some volume and some scale.

To give you an idea, the vertical system for an acre will give you around 4000 towers and it will cost you around Rs.2700000. In an NFT, one acre may cost you around 1 Cr. So the cost varies and these are rough numbers.

Does the open air system have no green house involved?

Yes, it is in open air and hence cheaper. But you need to deal with the natural variations. Hence, it doesn't have the same advantages as the other systems. But we increase the plant population by about 3 times, roughly. We go for a reasonable scale up. But we can offer at least double the production.

Do you have a strawberry system that you developed? Was it only installed where strawberries are traditionally grown?

We have installed it at several locations and they have done very well. It has picked up well in some places and notso-well in the others. It did very well in Ooty, Pune, Mamleshwar, Himachal, etc. It was average in Kolapur. Baroda and Delhi it did not do well.

In Pune the only place viable for strawberry cultivation?

We had a research facility in Wagholi, Pune. We did strawberries there and it did well. We did not make this a popular choice for people because of certain logistic problems. These are poly Styrofoam pots and they are very light. If I should transport these to say, Hyderabad or Kolkata etc. the transportation cost will not make it a viable project. Hence, I opted not to popularize it unless a huge project comes into picture which will enable me to get a manufacturing unit at that place. I do suggest strawberries in Pune though.

Do we have a lot of crop choices in hydroponics?

On the domestic front, with home growing kits, you can grow up to 200 different species of crops. But on the commercial side, we can have only about 14-15 crops. You can grow all the rest but there is no market for it. Other than these 14-15 crops, the rest are exotic which may not be suited for the local market.

Can we do lady's finger using hydroponics?

Yes, it is fairly climate independent. That is a big advantage. Hydroponics is a controlled environment agriculture. You have the liberty to take chances. In the controlled environment agriculture, we shut the weather outside and create a different environment inside.

Do we need different set ups for different crops, in hydroponics?

That is the ideal and right approach to do it. However, the reality is slightly different. For example, the float system is a unique one. We recommend that you grow one species in that system. However, in NFT we can take a little more liberty. You can have say, 70% lettuce and 30% of

another crop. You can develop the nutrition in such a way that it works well. But ideally every plant has its own unique r e q u i r e ments.

In aquaponics, since water is re-

used, will that not affect the fishes?

One of the biggest advantages there is fish excreta which is rich in ammonia, nitrate and nitrites. We need to get rid of that or else it will kill the fish. The right amount of pH should be maintained in the fish area. Cleaning the water becomes much easier if you can have bigger ponds because you have lots of biological activities that happens by nature in big ponds. But in an aquaponic system, the volumes are small so any-

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thing can wrong very fast. So the waste needs to be bumped off quickly. Hence it goes through a filter, you do sedimentation, push it through biological filters and then it is taken to the plant bed. The plant takes up all the ammonia and nitrates and returns good water back to the tank.

How do you support your clients?

We have different ways of engaging with our clients. We train people and we hand hold them for a year. We also do marketing contracts with them. We have a separate marketing and growing team. The growing team has the responsibility of growing the product, train people, educate them about hygiene, water quality, nutrition management, environment and pest management etc.

The marketing team writes out an offer and makes a contract to buy back the produce at the agreed rate for the agreed time frame. This can be either continued or discontinued as per the client's decision.

Please share details on the growing medium.

Growing medium is highly crucial. I like to look at whatever local material I have with me. For instance, in Uttarakhand I use rice hulls which is a waste product. In other places I get similar but different agricultural waste. I do quick studies on these things and understand if it is useful for me as a media to be used in hydroponics. The cost is a very important factor and media can influence the cost a lot. In India, we are very fortunate to have a robust coconut industry which most countries don't have. Even then it can be expensive for some people. In the South I would opt for coconut waste. In the West, I would opt for rice hull or other inert media. Likewise other parts of India.

How can we manage / prevent algae formation in the NFT reservoir?

Algae as such is not harmful. It sometimes bumps the pH up. But, yes it doesn't look good. It also takes up your nutrition. Keeping the pH low keeps algae away because algae needs high pH to survive. Another way to clear algae is to do it manually. Also keep off light from penetrating your reservoirs.

One thing that can be done is, clean out

the tank, paint it black from the outside. Upon drying, paint it with a double coat white. This will keep algae away. But you will still have algae in your channels which can be simply wiped down. This is why I don't recommend closed channels because in the long run it becomes a problem.

What is the ideal pH and EC levels for greens cultivation?

The ideal pH should be 5.8 - 6.5. EC should not go beyond 2.

How much do you charge for 1 year consultancy acre wise?

Our pricing structure doesn't work that way. We don't give out random figures. We will have to see the project and then decide the potential. We then take a little share of it which is affordable for the person. Quoting a random sum may just kill the project. We want the project to succeed and sustain.

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- * Agribusiness & Plantation Management
- * Food Processing & Business Management
- * Agricultural Export & Business Management





Quantity, in all industries, has become more or a less a once upon a time thing. The focus today is quantity with quality. Along with his team, Mr. Ramkrishna of Intello Labs works effectively in the quality space.

"We do quality assessment using images and artificial intelligence. I will briefly walk through what we do and how we bring value to the agricultural ecosystem."

One of the major problems in the food business today is food loss. There is tremendous amount of loss realised across the supply chain in different parts of the agricultural ecosystem. About 20% of the fresh produce gets lost in the supply chain.

Also, consumers are getting more demanding in terms of quality, safety, nutritional value. They are also wiling to pay premium charges for better quality goods. Food businesses struggle to meet these expectations. That happens because the existing tools, technologies and processes from our traditional approach are non optimal. There is high level of subjectivity involved in the way people assess quality. You do not have super scale labors. So anybody who is an operations person starts assessing quality and doesnt really understand it enough. There is zero auditability. You cannot determine what happened 1 week prior. If it is termed good quality we just accept it. Then, later you see bad items, dump and losses. There is a cost of resources. One may say that it is cheap to hire low cost labor and put him on the field to assess quality. But eventually, when you look at the total cost of dump, rejections, consumer compliance, management time to address all these issues, etc makes it an extremely expensive exercise. When we have used the technology and assessed the quality, showed the data to different clients we get a response that they never knew that the problem was so severe. That is how transparent technology can make things.

Intello Labs has come up with an AI based product that can be operated through a mobile phone or fixed cameras which help you click images of the item. Once the image is clicked, the algorithm starts analyzing each element in the picture and generating a report. You get a quality score on the percentage of good and bad items within the product. Over a period you get to see brilliant dashboards - trends and reports that help you take informed decisions. It helps you assess if you should stop procuring certain products at certain seasons, etc.

"To delve deeper, the algorithm starts drawing contours around every element in the image. It is streamed by uploading few hundred types of images of the same defect. Depending upon the organisation's definitions, practices and threshold, it shoots an output."

M Ramakrishnan

Vice President, Sales and Marketing, Intello Labs, New Delhi



ell us about your products

The mobile app is called as Intello Track Solution. It is portable and can be deployed across the supply chain. It can be used at the farm gate level, collection centre, warehouse or fulfilment centre. In physical retail stores, companies use it to monitor the shelf quality. All retail operations have Standard Operating Procedures that one is supposed to check the quality of the top-most item 3-4 times a day because that is what the consumer looks at. If they see a bad quality item on top of the shelf, they walk away. They don't sort. Hence, data collection should be streamlined and organized. You should keep track who came and checked and when and what losses were incurred. This helps tighten the process across the board. In physical retail we have had people using this to check the quality of the dump as well.

Another product we have is Intello Sort. We take the same mobile based technology and implement it to a machine so that the machine segregates the good vs bad items automatically. We have a fixed camera, roller belt where the items are rotating 360 degrees so that you get a full assessment of the item and not just its top layer. Depending on whether it is good or bad it moves to another zone. It can be used for multiple commodities. We are training it for round items to start with . Very soon it will be used for apples, oranges, pomegranate etc.

We are have a great reputation and work with established brands across the US, India, Indonesia, Thailand, etc. We also work with someof the most respected accelerators around the globe like Thrive (US), Grow (Singapore), etc. We work with more than 40 different commodities. We know there are other companies in this space but so far nobody has such wide a range in terms of coverage.

A case study

We have developed a case study to show how we have been implementing this in different locations. When one of the largest ecommerce companies in India started off with fresh produce as part of their grocery business, they did not have a well-documented quality manual. So, we worked with them and helped them define and measure quality. They were also very progressive and forward looking. They were not interested in who brought what for them to



sell, they were interested in the quality of the products they would be handing over to their consumers.

Hence, we started with the benchmarking exercise at the consumer end. We did mystery shopping, order from different online stores and from some physical retail stores. We would then measure and compare their quality. We would tell the client at what position they stand in comparison to others in the market.

We would then trace the problem back to the farm level. We would map to where in the supply chain could this have been rectified. It could be at the farm level, packaging level etc. It was a some great quality work. They even shared these findings with all their suppliers and educated them about the quality journey they had embarked on. A few months after this implementation, if they had a problem with say ginger perhaps because it was too muddy, they could have simpler conversations with their vendors. We have been working with them for a year now and within about 6-8 months of engagement we saw that their customer complaints, refunds etc. started declining by about 50%. There was also a hike in customer score by about 20%.

How do you price your products?

This is a subscription based model. We offer a license and the license fee is a monthly one which depends on the quantum of images you take. Hence, number of commodities influences the number of licenses and hence the number of images and depending on that we charge a certain fee.

Do you offer services to the farmers as well?

We are doing a small test exercise now. It is a free distribution to farmers and FPOs for a short period. We are interested in seeing if this increases the adoption and / or it helps us influence other businesses into adopting our technology. From a revenue generation point of view, this is primarily a B2B model.

What products do you cover?

We cover about 45 different fruits and vegetables like potatoes, onion, tomato, apple, orange, pomegranate, banana, bottle gourd, bitter gourd, etc. Most of the items that are consumed on a daily basis is covered.

Do you have any grading system for arecanuts?

Not right now, sorry because we primarily focus on fruits and vegetables. We can discuss it offline. We need to understand your annual production etc.

This technology I understand is used only for fresh foods right?

Yes. the technology can be used for multiple things. But we as a company are focused on fresh fruits and vegetables. We have done it for cardamom. Hence, it can be done for grains and other spices as well.

Can you explain how things shape up between imaging to analysing?

The image is uploaded to the cloud. On the cloud, the uploaded image is checked and a analysed as per the programming and data that is fed into the system. The algorithm is fed into the system, so that the system can analyse the product for any defects.

How do the farmers get trained about the quality of production - do you provide it?

The farmers typically know a few common quality parameters which people look into. We do help them with the fact that they can also use the app. To share an example, we had a farmer who used our application to sell his oranges. He had his stock at a cold storage at MP. He got our app, got a quality report in pdf format and shared that information on WhatsApp with his contacts. We were worried because he was outright that the oranges were of 80% quality. But we realised that for every grade, there is a buyer out there with a price in mind. He got a buyer who likes the transparency and he closed the deal.

We help in this perspective, We do not do direct training.

Is this app only limited for vegetables or is it something you would do for grains / pulses as well?

As of now we are focusing on fruits and vegetables. We may move into the grains and pulses sector in future. The method, of course, can be used for other products as well.

Can we use this technology for soil analysis?

No, it doesn't work for soil analysis. You can train the technology only with whatever you can see with the human eye.

Do you use this for leafy vegetables as well?

Yes and no. We can do greens as well. We have done it for an ecommerce company. The challenge there is in leaves, you have to manually segregate each leaf to take the image and assess if it is of good quality. So if you are doing a benchmarking exercise, you can do it on a sample. Otherwise on a mass scale, at a farm / warehouse level, it doesn't work easily for leaves.

How about factors like over ripening, etc.?

Ripe / under ripe / over ripe is part of the assessment. That is primarily done by looking at the color of the item. We are not analysing anything that would be interior to the fruit. It is an exterior analysis.

Does this technology bias the outcome?

Not at all. Rather it brings complete transparency in the system. The quality assessment is objective, unbiased and system-driven.

How does your technology compare with what is available around the world?

We have demonstrated impact for large, reputed companies around the world. We have an established client base in the US and APAC. In India, we are working with lot of large retailers, wholesalers and many ecommerce companies. Hence, we have proven ourselves in comparison with what is available in the market across the globe.

Does the sorting and grading happen at the warehouse level and packing level?

It can be deployed across the supply chain. It can be at the farmgate level, collection centre, distribution centre or a warehouse. It can be at a physical store. All that is possible.

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Dr.Raja Shankar

Principal Scientist Division of Vegetable crops Indian Institute of Horticulture Research, Bangalore

hat are the different varieties of moringa that are available? We have collected near-

lv 155 germplasm from across the country and tested them at IIHR. We found many of them superior in nutrition over the commercial varieties in terms of leaf yield and quality. We are working on advancing those varieties. Though 14 species of drumstick is available among them only 3 species are commercially exploited. Among them Moringa olifera is a species which most widely exploited. Presently, several African, American and European countries are also trying their hands at moringa for commercial exploitation. But, our climatic conditions are more suitable for the plant because it suits for round the year cultivation. Maharashtra, Gujarat, Madhya Pradesh and Southern India is best suited for moringa production however, cold regions contribution is significantly low. We are trying to develop varieties which can grow in those regions as well.

Some of the varieties suitable for commercial production are: • PKM-1

- PKM-2
- GKVK-1
- Bhagya
- Konkan Ruchira
- Thar Harsha

PKM1 is the most popular variety.

How can we increase moringa production?

There are certain techniques you can employ to increase moringa production. For 1 acre you need 650 seeds. The seeds must be of high quality and should be treated. You can develop your seedlings under nursery conditions or direct sowing of seeds as well. Ensure adequate sunlight if you opt for nursery conditions. Less sunight causes seedlings growth lean and thin. Once the seedlings are established, it should be transplanted to the main field after reaching a height of 25-30cm. The spacing you need to maintain is 2.5mt x 2.5mt for annual type crop and 5.0mt x5.0mt for perennial varieties. If you notice some plants bending over, ensure it is given support at initialstage of crop.

The crop requires 100gm urea, 100 gm super phosphate and 50gm murate of Potash. In the 3rd and 6th month, ap-

Dr.Raja Shankar comes with over 18 years of experience and specialises in vegetable breeding. He talks in detail about moringa / drumstick cultivation.

Dr.Raja Shankar says, "Drumstick is quite a popular crop of our country. It originated in India itself and hence it has a lot of genetic potential, which we haven't explored to its optimum. The crop has been mentioned as a Brahma Vruskha in our ancient literature due to its medicinal value and remedy for many diseases. Gradually today, the crop is gaining a lot of momentum not just domestically but for export and value addition as well."

Talking about the benefits of the plant, Dr.Raja Shankar explains, "Every part of the drumstick (moringa) crop is edible. Every part of it is useful in some form or the other. Owing to its medicinal value, it is often referred to as a multivitamin plant. It is also often referred to as the never-die plant because once planted the crop never dies during severe drought too. The crop keeps sprouting back from the roots even in adverse conditions. It can be grown anywhere in our country.

This crop can even be given as animal fodder. It has gained much popularity in the Animal Science division. It is used as a malnourishment remedy in African countries. The seed has 42% oil. Grinding 1 kg seed will give you 420gm oil. About 70% of this oil contains oleic acid and hence it is an expensive oil like olive oil. Seed extract of this plant is utilized in filtering the water as an organic alternate for alam.

Coming to its nutritional aspects, it is rich in calcium, iron and vitamin A. Consumption of 10gm of moringa leaf powder is an excellent source to supply significant amount of daily requiremnent of nutrients to the body. It has digestible proteins. 8gm of powder reduces about 27% glucose levels in diabetic patient. It is also rich in calcium, magnesium, potassium and iron. Seed extracts can be used to cure swellings in the body. Moringa helps with asthma and cancer."

India and the Moringa

Currently, India is the top producer and supplier of drumstick, globally. In our country, Andhra Pradesh, Karnataka and Tamil Nadu are the main contributors of moringa. We produce moringa on about 40000 hectares. In the global market the demand for moringa is expected to be rapidly increase in the coming years. Hence, the potential is huge. The export potential is increasing by about 30% every year. From 2014 - 2016, every year, India exported 16000 tonnes of drumstick, globally. China, Canada, US, South Korea, Germany and many European countries import moringa from India.

This potential must be utilized to the optimum and currently we have some commercial varieties.



ply 100 gm of urea as top dressing. This plant is shallow-rooted unlike other perennial trees. Hence, if there is water stagnation, the plant will most likely die due to root rot. Hence, ensure there is sufficient soil around the tree (mounting) so as to avoid direct water contact with trunk. In 7-10 days interval irrigation is required for the annual variety. You need to irrigate between 10-15 days for perennial versions. Adequate irrigation must be provided during fruit development and maturity stages. Flood irrigation or drip system can be employed.

Weed management

Keep the field weed-free for the first 3 months. In the first 3 months if the crop faces any competition with weeds, the growth gets hampered. 3-4 weeding is required during the vegetative growth phase. Alternatively, you can opt for herbicide application. Glyphosate can be applied before planting of the seed-ling in the main field.

If the temperature is too much a lot of flower drop takes place which affects the fruit setting. During pollination or flowering if a farmer employs any farm protection like spraying of pesticides etc. the pollination process gets disturbed. Drumstick follows mixed mating system. Both self (26%) and cross pollination (74%) takes place depending on the flower structure and its growing environment. The plant gives fruits during the monsoons and summer where monsoon crop yields lesser as compared to summer crop.

You can get 200-250 fruits per tree. Among these, about 170 fruits would be genetically impure. But these seeds cannot be differentiated by its outward appearance. Hence, the farmers source their seeds from authentic/organised seed production sources are advised.

When can we harvest fruits?

For consumption purposes, the fruits should be harvested at green stage after about 180 days of sowing. This is usually between March-June and September-October. In the first year, expect only 8-10 kg yield per tree. But, this will increase in the coming years. Second year you expect a yield of 24kg per tree. The next year you stand to get 40kg per tree and after that 56kg and so and on and so forth. This crop gives you progressive harvest. On an average you can harvest about 30-35kg fruits per tree per year. If you are talking about seed yield, from about 1600 plants/ha, you can get about 1600kg seeds. Another important aspect is the leaf yield. We are currently developing a variety rich in leaf yield and higher nutrients.

What if we are interested in harvesting leafs?

If a farmer focuses on leaf production, ultra high density planting would be the best option. This will enhance the leaf yield and would give great scope for export operations. Using ultra high density planting, you can grow 3.5-10.0 lakh seedlings in 1 hectare. This will give you a yield of about 30-75 tonnes of fresh leaf which when processed gives you 5-11.0 tonnes of dry leaf. If you aim at venturing into manufacturing leaf powder, the twigs should not be used.

How nutritious are the leaf powder?

Leaf powder and fruit powder are known to have huge nutritional values. If farmer is aiming for leaf production, the plants are not permitted for fruiting where leaves should be harvested at 2-2.5months growth (befor flowering) when the leaves contains high minerals. Leaves must be plucked using the tools like scissors. Make leaf bundles and wash it 3-4 times. The washed bundles must then be hung in open or ventilated places with dust free condition so that the water drains off followed by room drying and solar drying of leaves.

In room drying, spread the leaflets thinly on mesh tied on in a well-ventilated, dust proof room. Turn the leaves over at least once, with sterile gloves, to improve uniform drying. Leaves should be completely dry within a maximum of 4 days.The loading density should not exceed 1 kg/m2

In solar drying, spread the leaves thinly on mesh and dry in the dryer for about 4 hours (Temperature range is 35°C–55°C) on a very sunny day. The leaves get burned when the temperature exceeds 55°C. Once the moisture content of the leaves at 7-10%, you can go for milling (0.mm to 1.5mm). The leaf powder onsorbs moisture very fast so it have to be stored at dry condition and packed in airtight containers. You can sell these as leaf powder for different purposes and in recent times it is also added in bakery items for nutrients exploitation such as biscuits and come up with such innovative products.

Who are the target customers for moringa powder?

It is best sold internationally. Germany, USA and China imports a lot of this from India.



How can we keep the crop safe from diseases?

This crop is generally not disease prone. But there are two major pests that can attack the plant - leaf-eating caterpillar which attacks during the vegetative stage and pod fly which attacks at the fruit-setting stage.

To mitigate the leaf-eating caterpillar attacks, disturb the soil around the tree, collect and destroy affected leaves and set up light traps. One light trap per hectare is sufficient. Any kind of perching arrangement for birds can help because birds feed on the caterpillar larvae. Alternatively there are sprays available in the market. Whatever way you choose to mitigate it, ensure that you take care of the plants and tackle it at the initial infestation stages. It would take only 10-15 days for the pest



to wipe out the entire plant. Pod flies can be dealt by using fermented tomatoes around the trees. You can also use sprays as well.

What would the approximate cost of cultivation be?

The crop cultivation incurs 77% operational costs and 22% fixed cost. Total cost of cultivation comes up to around Rs.86000/-. You can make a gross income of about 5.69L and the cost output ratio is 6.62. Pods sell at a higher value than leaves in today's market condition however leaves are gaining higher price due to export and leave powder price is about Rs 1000/kg depending on qual-



Is this crop commercially viable in places of extreme temperatures?

You can grow it for self consumption. But commercial production may not be a good idea in places that have extreme low temperatures. Even the temperature during flowering and fruit setting stage exceeds >35 oC causes pollination issues and poor fruit set. At optimum temperature you will get more fruits only in the summers. Winter may not bear you any fruits. Total harvest will

get compromised and this will hamper profitability.

How frequently should the moringa plant be pruned?

You can prune after harvesting is completed. On pruning, within 15 days after you see new sprouts from the branches. After planting the crop, it should be pruned the terminal shoot at 1 mt height from the ground level. This is to increase the

number of the side branches. After you harvest the fruits, each prunned branch should have at least 5-6 nodes so as to sprout and produce shoots for the next crop. Hence cutting point at base of the branch may be avoided.

Is there a season best suited for extracting moringa oil?

Summer crops give you more seed yield than monsoon crops. To extract oil from seeds you need more fruits. Of course, in south indian states it is a 2-season crop. Oil extraction is more favorable in such states.

Do you know of sources for the best variety of seeds?

The best seeds are of PKM1 and PKM2 varieties developed by Tamil Nadu Agricultural University. You can source it from them. Then, there is Bhagya, which is a variety developed by University of Horticultural Science, Bagalkot. Konkan Ruchira is available at MPKV, Raguri. Thar Harsha- a drought-tolerant variety which is also less prone to caterpillar attacks released by Central Institute for Arid Horticulture, Bikaner

(Rajasthan)

What is the soil requirement for moringa?

Other than deep clay soil, all soils are good for moringa cultivation.

Can we grow moringa in high-rainfall areas?

Commercially speaking, it is not advisable. The plant will grow but leaf and fruit yield will be very less.

Can moringa fruits be canned and sold?

You can certainly try. If you are targetting customers from South India, it may not work because they are fond of the matured fruit. But the Eastern part of the country may be in favor of the immatured fruits so that should perhaps be your target customers.

Do we have facilities which can be visited where processing and value addition is being done?

Yes, you can visit our office and get information regarding our product development division. You can check our products and get trained as well.

What is the reason for leaf falls?

Leaf falls happen because of two reasons:

1. Disturbance in the root system: this can be due to over irrigation or stagnation of water. Depending on what the issue is you have to either provide drainage facility or understand the moisture content in the soil and irrigate accordingly

2. Pest attack: identify the pest and then you can sort it accordingly.

Do you help with marketing?

We don't. But,you can get in touch with us, we have contacts that we can share.

Do you have any tips on marketing?

You have the domestic and export markets. It is best to have tie-up with malls and/or agents. Find people in your area/state. This is the best way to move forward. You can approach APEDA for further information.

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ity. Then, there is seed oil also one can explore. Moringa seed oil is available at different rates depending on its quaity. 500ml seed oil can fetch you about Rs.3000/- You can get about 1000-1500 seeds per hectare (400-500lit oil per hectare).

Where can we find centres that educate farmers about the right moringa cultivation practices?

There are trained professionals at IIHR whose help you can seek. Then you have Tamil Nadu Agricultural University and GKVK, Bangalore, University of Horticultural Science, Bagalkot offers training programmes.

Do we have centres of export for these products?

This is not such an organised space. Farmers export through agents. You can get more information at the research centres and agricultural institutes.

What is the difference between perennial and annual varieties?

The crop is by nature perennial. Botanically this means, when you sow the seed collected from a tree and sown to



Partha Varanashi

Director Varanashi Farms, Dakshin Kannada

In the vast field of agriculture, we hear problem statements like soil health, pests, low production etc. Then we hear buzz words like natural farming, organic farming, sustainable agriculture etc.

Then we get to meet people like Mr.Partha Varanishi, Director at Varanashi Farms, who takes you from the surface to an in-depth understanding of the world around us and we realise that what we need the most in agriculture is in-depth understanding, respect and trust in nature and patience. Sustainable agriculture is about letting nature take its own course.

"Varanashi Farms is an ancestral property and an international destination for sustainable farming. We do multicrop tropical sustainable farm with full range macro / micro biology. All crops are in between forests and lot of water bodies."

Partha is grandson to a leading agriculturist of the yesteryears and his parents are agriculture scientists. They are microbiologists and zoologists who did their PhD in agriculture as well. Partha had the opportunity to travel to live, study and work in Australia.

"I did my Masters in Molecular Biology in Agriculture Biotechnology from University of Adelaide. I worked for LawrieCo Biological Farming. They were into biodynamic farming and so had the opportunity to assist farmers with good microbial products. I was also a part of the Green Movement in Australia helping farmers shift into a more sustainable way of farming. I spent considerable amounts of time at Food Forest with Graham and Annamarie Brookman. In 2012 I came back and joined my parents in their venture with agriculture research."



aranashi Research and Development Foundation is a 35-year old establishment. It has DIRO recognised laboratory. We have done projects with the German, Japanese, etc governments. The Varanashi Agro Sustainability Centre produces bio fertilizers and Varanashi organic manures which goes head to head with any chemical fertilizer. We have a lot of international clients.

Let us understand soil microbiology

Plants require sunlight (photons), water and air (Co2 and O2). This constitutes of 95% of plants nutritional needs. 5% of nutrition comes (macro and micro nutrients) from soil. The limiting factor that comes in between us and maximum yield from our farms is availability of:

- macronutrients nitrogen, phosphorus, potassium
- secondary nutrients calcium, magnesium, sulphur

• micro nutrients - Boron, Chlorine, Copper, iron, Manganese, Molybdenum and Zinc

Now, if we opt for chemical farming, we can simply mix the soil with NPK, urea etc. But then, these are very high in nutrients (29% +). However, plants cannot take in more than 1%. To take in nutrients at their best, the soil they are in need to be high on microbial activity which gets killed by chemical fertilizers. Even macro organisms like earthworms, millipedes, etc. gets eliminated. Furthermore, it changes pH and electrical conductivity of the soil. Chemical fertilizers also leech into the water bodies through the soil due to which our immune system gets affected. This is also scientifically proven and not hearsay. Thus, decade after decade farmlands have been heading towards non-sustainability.

Organic Framing and Bio Fertilizers:

Unlike chemical fertilizers, are not too high in nutrients. It is about 2-3%. The plant is capable of absorbing this. The capability of plant increases in the presence of micro and macro organisms. These organic manure is plant friendly. These do not tamper with pH or electrical conductivity and so movement of the nutrients are assured to the plant roots and this promotes good yield. It is human and animal friendly. These nutrients are more bioavailable and promotes sustainability by increasing soil biology, nutrients etc.

How does micro organisms increase plant nutrition?

We can categorize the role of micro organisms into different segments:

1. Decomposition of organic matter: Organic matter is anything from a leaf to a banana peel. Initially bugs eat them and so it gets reduced to smaller bits, which are attacked by good micro organisms which further break them down into molecular form. Once in molecular form they can be easily absorbed by plant roots.

2. Fight diseases and kills germs: Imagine rats in your house. You have two options now:

• get rat poison and put it everywhere and putting ourselves, our children and pets at health risks as well. OR



• bring in a cat that chases away or eats the rats - this is biocontrol

In the same way our plants get attacked by certain pathogens that can cause wilting, root fungi etc. In such instances, we use something called Trichoderma. Trichoderma is another type of fungus which does not adversely affect plants but kills and feeds on the harmful pathogens. Trichoderma is a beneficial micro organism which also produces indoleacetic acid which is a growth regulator that helps increase the shoot size.

Increases root aeration and soil water absorbing and holding capacity. Lets take the example of a soap. If we pour water over it, there is absorption of water on its entire surface area. If you put microbes on it, the soap gets broken down into tiny pieces and so water absorption over the surface becomes more because the surface area of all the tiny bits put together is higher. Micro organisms make the soil porous and makes it like a sponge. Hence, the absorption capacity goes higher.

How do you invite microbes into your farm?

1. Stop using chemical fertilizers and poisonous pesticides

2. Use naturally available manure and organic manure - the yield may fall the first two years but this can be altered for the better

3. increase organic matter on your farm and choose multi crop system

4. Innoculate your farm with beneficial microorganisms. The first few years you may have to innoculate it twice or three times a year. Gradually they will start growing by themselves. 5 years down the line, you will stop using chemical fertilizers. The best part of this is when your farm is filled with beneficial micro organisms, pathogens don't attack your farm at all.

Pathogens look for an environment that they can breed in but good microbes do not give them that space.

Countries around the globe are turning to this method and we need to catch up. We had the best of technologies thousands of years ago with ayurveda etc. Unfortunately, we chose to go a different direction with green revolution. But we can fix it by moving in the right direction.



How do we maintain the soil organic Carbon?

Carbon is in abundance on this planet. Organic matter has carbon in it. Hence, we need to have enough amount of organic matter in our farm and allow these microbes to degrade it. There is carbon everywhere but available Carbon is what is important. For Carbon to be bio available it should be degraded to its form. Hence, have lot of organic material - anything from leaves, dead animals, animal manure, branches etc.

What are the different crops on your farm - what is the source of income for Varanashi Farms?

We have different levels of income from our farm.

We have about 350 arecanut plants, nutmeg, pepper, coconut, cocoa and banana, jackfruits, pappava. Cocoa is not very pricey in India but it is a worldwide crop and a very stable one. Cocoa beans are very high in nutrients and it is a super food. But it is made into chocolates which is not great for us. I am a coach for Team India - Swimming. I make my athletes eat cocoa beans and they win international medals. We have a nursery as well which supplements our income. We have another programme that we are starting up. We have very basic houses built. We have people from all over the globe coming and staying with us and working on our farm to experience this life. We started this in a small way but people loved to come to experience farms. That also fetches us good money. We charge upto Rs.800 a day with basic food and accommodation.

Is your farm a profitable venture?

It is. Including the forest area we have

around 45 - 50 acres with a cultivated area of about 23 acres. The expense is less.

Honestly since last year we have been manuring our farms less. We see that the plants' immune system has become better and they are more disease resistant. Likewise, it is going to be better down the line. Also, we are all at our best health. My mother is 64 and very strong and so is everybody on the farm.

How do you look at white ants - are they useful or destructive?

White ants or termites is a huge problem. They are a problem for us too. The only thing to counter termites is having ants. Invite more ants and bird species on your farm to have a bio control over termites. But, I don't know any other better way to fight termites and we are also struggling in this space. Ants occupy termites' space and keeps them away.

Do you suggest bio agents to remove weeds?

I am strongly against spraying weedicides because macro and micro organisms die and symbiosis ceases. Plants need sunlight to grow and so do weeds. We have multicropping on our field, the sunlight is taken pretty much by the top layer and mid layers like arecanut, coconut, nutmeg and cocoa. There is hardly any sunlight on the ground. That way we are blocking sunlight for weeds to grow. The second thing, we don't clean up the leaves that fall onto





the ground. We leave it there to block out the sun and it is great for plants and keeps weeds away.

Did you also try your farming practices in Australia or was it all learned here?

I was born and brought up here. When I was studying my parents were PhD holders. I did my Bachelor's project here on the farm and we were doing really well in terms of convincing people into organic farming. There was soil research going on in our research center. But there is an age when you are rebels when you grow up and you don't want to do the things that is around you. I wanted to learn bio technology which was totally into genetical manipulation. I did my Masters in the space of interfering with Barley DNA and making stem thicker. When I was in Australia, I had an opportunity to interact with the top most agriculturists in the world. I got to realise that these agriculturists have great regard for my parents and consider my farm as a progressive sustainable farm. So, during the 6 years I was there I realised how much of abundance I left behind here. Gradually, I shifted from high science stuff like molecular biology into farming.

Isn't Australia subject to a lot of drought?

Yes, Australia is super short on water. The farm I went to used to get only 20 cms of water for the whole year. They harvest water very well and grow around 200 varieties of fruits and nuts on their farm. It is all about water harvesting. I remember seeing my parents and grandfather tensing up when I was a child when summer arrives. In due course, my father took water harvesting very seriously. We had trenches all around the place. We get the running water to slow down, slow moving water to crawl and crawling water to stop and seep into the ground. Every year you improve your ground water. Today we have so much of excess water that we can do farming on 4 times more land than we do now. That is the water wealth that we have now.



Take water harvesting seriously and implement it meticulously.

Have you tried liquid nutrients on your farm?

The company I used to work with in Australia used to do this. They used to mix up micro and macro nutrients and they used to make it like a liquid brew and send to the farms. There are companies doing it here too. This is definitely more effective than putting chemicals into the farm. These farms are called bio dynamic farms. Bio dynamic farming employs use a little bit of chemicals too but in a limited manner so that all micro organisms do not die off. I wouldn't call it sustainable though because we are still dependable on big companies for micro organisms. But if you want to start off with a good lead because you have invested lot of money and make up for it, you can start off the bio dynamic agriculture and work your way into the organic methodology.

Sustainable farming is possible only when you have no dependency on any other organization for your farming activities. It should be self sustainable.

Do you help others grow micro organisms themselves?

Of course! You can buy manure or compost from us and directly apply to your farms. Alternatively we can give you the cultures. You can put this cultures in your compost. One kg of the material that we give is enough for you to do 100 kg of compost.

Please explain how to bring about wilt control in black pepper.

The main cause for wilting is a fungus called Fusarium. There is a champion fungus called Trichoderma Polysporum. It can withstand up to 2ppm copper sulphate. There is a lot of people, including us, selling this. Once you use Trichoderma in your pepper plant, the colonies of Trichoderma starts growing on your farm and it will definitely take 2-3 years before the whole colony goes full fledged and completely put an end to the wilting problem, but you will begin seeing the difference from the first year itself. Once you put this micro organism, you don't have to put in any other poisonous stuff on your farm. The good bacteria will take over and the Fusarium will fly away.

At what age of the plant can we apply plant hormones?

We do not use hormones. Microbes produce hormones, which is healthy and natural. We don't use synthesized hormones.

How do you control pathogens by using organic manures and bio fertilizers?

The very first thing to make a plant withstand pathogens is by making it strong within. It needs to get its sunlight, water, CO₂ and micro and secondary nutrients. For that, making the whole system bio available is very important for this to happen. Use organic manure so that the plant grows happily. Also, introduction of bio control agents like trichoderma, bacillus species and a whole bunch of these good bacteria that can fight and not give space for pathogens to enter your farm.

Does the culture you produce need specific components in the compost?

Yes, it does. That is why we give you the technology on how to grow as well. Let me explain it this way, we humans take different forms in various stages of life - we are an embryo, then a baby, a child, a youth an adult. We are the strongest when we are in our youth. Most of the microbial cultures available in the market are in liquid form when it is in the spore form - one of the stages of the microbe's life. We do it differently. We take coffee husk, sterilize it in an autoclave, inoculate it with the good microbes and we incubate it at a comfortable temperature. This helps it grow to its lock phase, which is their youth phase. Hence, we sell microbes in their vouth phase to farmers so that it multiplies faster, produce spores and build colonies faster. We also train farmers to do this at their place themselves.

When can we come and stay at your place?

We are open. Just give us a call and we can set up one of the houses for you. As long as you can get a negative Corona certificate, we are open to have you over.

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Raja Kumaran

Director Mobitech Wireless Solution Pvt Ltd Erode, Tamil Nadu

Gone are the days when wastage was hardly given any importance. In today's day and age when every resource is draining out the buzz word is precision.

Mobitech Wireless Solution is a electronic integrated company who is into the manufacturing of irrigation automation controller systems since 2010. Our business theme is irrigation automation.

hat is the need for irrigation automation? Increase in crop production is every farmer's dream and aim by

effective reduction of labor, water, cost, effort etc. In India, there are three types of irrigation:

1. Flood irrigation (80% of farms are irrigated using flood irrigation)

- Uncontrolled and uneven water application
- Labor intensive
- land should be levelled and shaped
- Cannot be automated
- Need more labor
- 2. Drip irrigation and
- 3. Sprinkler irrigation

Mr.Raja Kumaran, Director / Marketing and Sales in-charge says, "In 2010 we started this business and we developed a smart tool called the Cell Phone Motor Starter. Through this the farmer can switch the pump set on and off and keep his furrows proper and ready for the next irrigation session. With a missed call, the controller receives a signal from the farmer and automatically switches the pump set on. Once it is on, the water flows through the furrow and reaches the crops. However, there is no acknowledgement if the trees or crops has received proper irrigation. This controller is suitable from 0.5Hp to 500HP pump set. Hence, making it suitable for all farmers' needs.

What are the advantages of this equipment?

There are many:

• Farmer can switch the pump set on from remote locations.

- It protects the pump set from electricity fluctuations, dry run and over load.
- Signals the farmer when there is no water
- Farmer gets data on the time intervals for which the pump set was switched on, etc.

• Can be controlled using smart phones or regular mobile phones

How has the market response been so far?

We have sold more than 2.5L units all over India. It was our basic product.

After 2011, we got enquiries for automation of the ball valve of drip and sprinkler irrigation apparatus. Hence, we developed the SMS-based drip and sprinkler irrigation automation system. In our experience, the scope of this business is very huge. Only 9 million hectares of cultivable land is covered under micro irrigation.

Advantages of Micro irrigation:

• Farmers can save 40% of water in comparison to flood irrigation

• Fertilizer and nutrient loss is minimized

- High water application efficiency
- Low weed growth
- · Less labor intensive

• Field levelling is not a requirement and so highly recommendable for uneven land pieces.

Why automation?

General statistics show that farmers generally live away from their fields.



For example, a farmer who has 20 acres of farm may be staying 10 km away. This obviously calls for hiring manpower. If the manpower proves to be inefficient, plants will be in a state of stress. To avoid this, we have developed hybrid controllers which is fixed near to the motor starter (see image below).



The figure below shows the main controller into which a GSM SIM card needs to be inserted. With this the communication from controller to the cloud server gets streamlined. Replace the manual ball valve with electric solenoid valve. The size ranges from 1 inch to 4 inches.



Here's how the irrigation automation system works:

The main hybrid controller is powered by the GPRS data. The controller collects all field parameters, sends it to the cloud from where it reaches the farmers' smart phone.



There are five modes of irrigation available.

1. Time-based irrigation: For mango or pomegranate orchards for instance, a well-grown tree needs about 65 - 80 litres of water per day. This varies based on the season, type of crop etc. Through the solenoid valve the passage of water would be around 18000 litres. Based on the type of pump, we calculate and fix the time required for irrigation. Automatically the controller switches it on and opens the solenoid valve and starts the irrigation process. This mode holds 70% - 80% accuracy.

2. Volume-based irrigation: The farmer needs to fix an electromagnetic flow meter to ensure that the required amount of water gets fed to the farm. This has a 95% accuracy.

3. Autonomous irrigation: This is the latest. Whenever the plant / tree needs water, the soil moisture sensor triggers the controller and ensures automatic irrigation.

4. Centralized system: We recommend this to farmers who has installed drip / sprinkler irrigation system on the farm for the first time. Through this system, all control valves can be kept at one common place and divert pipelines to the field. The advantages of this method are that the wire cost will be low and the maintenance is very easy.

5. Decentralized system: If, for example, the farmer may have deployed the drip irrigation system and wish to switch to automation, we recommend only changing the ball valve to solenoid valve and connecting the wire from the valve to the controller point. In this case, the maintenance cost can get worrying because it may get in the way of tractors etc. So protection should be high priority.

We have wired and wireless automation. We recommend wired operation for farms that has no division. Wireless

> automation is recommended for farmers with patches of land and also for very big farms like 500 acres etc. This is solar powered.

Fertigation

Giving fertilizers along with irrigation is called fertigation. Plants can absorb nutrients only through water and it requires all the nutrients in the rhizosphere in optimum quantities. Every farmer follows some methodology or the other to ensure the plants get nutrition. In the normal fertilizer application process, for example, using a venturi pump, the farmers deploy around 10000 litres of water, lets say by 1:00pm to 1:30 pm. Here, the fertilizers gets to the plant by 1:07 pm. This means highly concentrated nutrients gets placed on top of the soil, but none or very less at the root zone of the plants. After



1:07pm, the watering goes on until 1:30 pm. This results in leeching out of the nutrients to below the root zone of the plant, which defeats the purpose. Also, the traditional practice is to apply only 1-2 nutrients at a time. But, this also won't do. Plants should get all nutrients in the proper amounts available at the root zone.

Hence we aim at precise fertigation through fertigation automation ventures. We have different varieties of this starting from the single injector to multi injectors based on the crops, area, crop age etc. Here we place phosphorous, nitrogen and potassium permanganate and acid in separate tanks with the main line connected throughout these fertigation benches and then be released to the field. We have installed this in a couple of fields already.

What is the cost?

This depends on the project undertaken. The normal process starts from the



valve size, which varies from 1 inch to 4 inches. 80% of the business demands 2 inches owing to the pump capacity. If the farmer goes for 2 inch, the price will be about Rs.12,000 – Rs.15000 per valve. This includes cost of the wire, controller, valve, GST, installation and counselling. That means for a 10 valve automation, the price range comes up to Rs.1, 20, 000 – Rs.1, 50,000.

We do turnkey projects also for farmers who have already deployed drip irrigation. If the farmers want to develop a new farm and we get an insight about the water source, we can plan out everything.

Does your system work for green houses as well? That is not an issue, it works.

Are there any government subsidies available for this project?

Government provides subsidies only for micro irrigation. I am not sure when the Central government will take this fur-



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applied to NBA for extension beyond June 2019.

Dr. K.K. Tripathy, IES Director, VAMNICOM

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ther and make it available for automated irrigation as well. In our experience, there is a 35% yield increase when irrigation is automated since 2010.

Who develops the mobile application for you?

Mobitech Wireless Solution is a private limited company and is owned by 3 directors as of now. I take care of the marketing department. Right from the designing of the PCP, we do it inhouse. We have the complete set up for developing software and front end as well. We have around 120 engineers working for us. We manufacture 100% of the system.

Does this system work for all kinds of fertilizers?

Yes. The only thing is that the fertilizer coming out of the tank should be highly purified. There shouldn't be any deposits. Hence, we suggest only water-soluble fertilizers. Manual fertilizers should not be diluted in water, unlike 100% water soluble fertilizer. In case of organic manure, only highly filtered organic material should be fed into the system. Or else, the drip irrigation system can get clogged and the injector pump will be deprived of proper suction.

How does it work with solar based drip irrigation system?

The basic principle of the drip irrigation system is that from the water source, the water should be pumped with optimum pressure. If this pressure is not maintained, there will be no proper wetting. With solar pumps this pressure is difficult to maintain. Hence, we suggest that all the water gets collected from the borewell to a common pond from there the open well submersible pump which is capable of producing around 5-6 bar pressure of water to the pipleline. It is not recommended to go for drip irrigation system directly using solar pumps.

I understand that data gets stored in the mobile application for 90 days - what happens after that?

Our server is capable of storing around 3 years of data but we make only the last 90 days' data available. If you want data prior to that, you simply have to mail us and we provide it via email.

We look forward to making the whole system on a subscription basis. So, if you want the data that goes beyond 90 days, the farmer will have to pay and download data.

The thing is by the day, the list of devices we bring out is increasing and all of these are coded into our server. We don't want to keep more information into the server which is a backup of more than 90 days.

What is the product warranty?

We give one-year warranty on the controller which we manufacture and 3 year warranty for all the vaults and other accessories. 90% of the components are serviceable. If there is any problem with the product, we either fix it or replace the product.

What is your market share in India?

To the best of my knowledge, it is not more than 0.1% because this is quite a virgin market and farmers prefer going for micro irrigation. Only 9 million hectares are under micro irriga-



tion. We have 54 million still under flood irrigation. This is the data as per 2019 Central Government records. The government wants to focus on precision irrigation. The potential is still high.

What is the consistency of the product performance? We began production at the end of 2009. Since 2010 we have been in the market. The only problem we are facing is conversion of rural farmers to use this technology. Their argument is that even if they go open the valves their field doesn't get



irrigated so how can he be assured that it will happen by tapping his phone. Our primary focus is hence on those farmers who has agriculture as his secondary line of business. For example, there are people who are primarily business men but have 20-30 acres of farmland as well. For him it is a grace to be relieved of labor to some extent. These farmers get what we say and understand the nuances of fertigation.

What is an ideal field area in which we can deploy these products from an investment perspective?

Farmers employ drip irrigation starting from 0.5 acres with no upper limit. If you have about 5 acres then his return of investment will not exceed 8 months to 1 year. So, we suggest 5 acres as a minimum plot of land.

Do you have any dealers in Karnataka?

We have an office in Bangalore. Mr.Rajshekhar from Davengere takes care of the Karnataka wing. He is the manager of that state. I can share his details if I am contacted personally. We have our presence in Tamil Nadu, Kerala, Karnataka, Telangana and Maharashtra.

What is the total cost per acre for a new set up?

The cost depends on the number of valves you will need. In 10

acre some farmers may need to use 10 valves whereas others may need to use 20 valves. One valve will cost you Rs.10,000-Rs.15000/-. The acreage varies depending upon the crop and the number of trees on the farm.

Do you have any unit in West Bengal through which you can offer a demo?

As of now we do not have offices, dealers or distribution networks at West Bengal. We are ready to do a demo upon request.

Who are your competitors?

Our head on competition is with two Israel-based companies. Both these companies have designed the controller based on their countries' requirement. In India the condition is different. We have a highly erratic electricity system. The farmer will have no clue about when the electricity will be on or off. So, we have designed our controller to suit Indian environments.

But Netafim and Galgal, the Israel-based companies, have developed equipments for Western countries. Their units cost also is much higher than ours. They have a price range of Rs.45000- Rs.55000/- Our product can be compared to their new product called Netbeat which is coupled with irrigation and fertigation automation.

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Vembar Nagaraj

Director, Ibex Sales and Consultancy Services

Animal attacks on farms has always been a matter of great concern. A need for a solution to keep animals away from farms without harming them always seemed like an unachievable idea. And then, Ibex Sales and Consultancy Services came along with a breakthrough!

Ibex Sales and Consultancy Services is a renowned company in Solar Power Fencing and also in finding solutions for other security aspects for industries, government agencies, etc. through our corporate office Ibexkayenn private limited.

Director at Ibex, Mr.Vembar Nagaraj says, "We have been around for the last 25-30 years and have had active collaborations with Gallagher, New Zealand who are pioneers in power fencing. About 30 years ago, when we started this in India we felt it was only in its concept level at the time. Hence, our biggest challenge was to educate farmers through demos etc. Gradually results started surfacing predominantly in forest areas where all animals from rabbit to elephants intruded into farms causing economic damage. This led to government paying heavy compensation to farmers. In that situation, power fences as a solution became an ideal path for them to choose. We teamed up with the forest department and handled several orders throughout India We have also carried out some installations with 10-15 year maintenance contract most of the fences are fiunctional even after 15 years.



n Introduction to Power Fences Traditional methods

of fencing have been many - trenches, walls, ditches, burning crackers, drum

beating, etc. This slowly transformed to barbed wire fencing, etc. While it is superior to the traditional methods of fencing, it has its disadvantages:

- 1. It can cause injuries
- 2. Installation cost is usually high
- 3. Doesn't really stop intrusion

4. It blocks the view. You never know who is hiding outside your fence once you have all the vegetation inside the farm.

To achieve the objective of optimum level security and to keep animals away, we came up with the Ibex Gallagher Powerfence system, which is a highly effective solution. It is an active barrier. Animals experience electric shock due to which they retreat and keep away from the farm. It acts as a psychological barrier as well. Hence, the attribute active barrier.

The system sends in pulsating current into the fence lines and at a duration of every 1to1.2 secs it gives a brief jolt which lasts for 3 milliseconds. This is a very short timing but the jolt it delivers is impactful for animals to experience something unpleasant enough to keep away from the area. The experience remains in their memory, building a psychological fear from approaching that part of the forest. The animals thereafter get conditioned to keep away from the farm, or rather the fence.

Animals also need to be incidentally trained. Sometimes, the animals do come in herds and try to push through. The advantage here is that when one animal gets jolt, all other in contact with that animal also get shockas a chain. This gets the entire herd to keepaway.

Installation systems

We have done about 500kms of fencing in 12 districts of Uttaranchal over a span of about 3 years time. We had a big contract with the energy renewal department at Uttarakhand, wherein we have done a 10-year AMC and successfully handed over the fences to the farmers. We have even built community fences there as well. Community management has proved more beneficial than that set up by individual farmers.

We have different configuration for different types of fences. We have 8-line fences, 12-line fences or 16-line fences. The fence is chosen depending on the animals around that place. On the whole, we have developed a compositecontrol fence system where a standard 8-line fence can control all kinds of animals. We have animal-specific energizers and perimeter-specific energizers. We customize solutions as per the need of the client and the area in which we install. We even provide batteryoperated systems in areas where that works best. We also have integrated systems with a battery, energizer and solar panel packed into one unit. We also have advanced energizers with the



Solar Fencing

Smartpower advantage. It comes with advanced lightning protection, voltage display, stored energy display, standby mode, etc. We have remote-controlled energizers.

Our energizers are of 3 types - 1Joule energizer, 12J and 5J

We have lightning diverters because lightning can cause harm to the functioning of the fences. To have a more effective shock, we recommend an earthing unit to be set up at every 150mts on the farm.

The power fence comes with some accessories:

1. Fence wire: 2.59mm high tensile wires galvanized and zinc coated to 30 microns preventing rusting even in adverse conditions.

2. Polypropylene reels (PP reels): Every intermediate post has this. This is also tested for up to 18000 V. Made of high quality engineered plastics

3. Wire tightener:made of aluminum alloy. Using this the wire can be effectively tightened or loosened for effective tension as per requirement on your fence.

4. Warning Sign Board:This is mandatory to display so that people can keep away from the fence.

5. Joint clamps: Flexible connectors required to connect the lines when you have 2 poles going from 2 corners.

6. Double insulated DI cable: normally used to connect the energizer to battery and battery to fence.

7. Galvanized single swing or double swing gates: for passage of the farmer and cattle safely. Traditional gates can get spoiled easily.

What are the advantages and disadvantages of this system?

Advantages:

1. Keeping animals - individual or herd - off to prevent farm damage





2. clear visibility: you can see if anybody is lurking behind the fence

3. It is not as expensive as other barriers

4. Negligible maintenance cost

Disadvantages:

1. The farm needs to be clear of vegetation underneath the fence. Weeds tend to come up there and cause a possible reduction of shock impact. There are people who have complained about this since it can get time-consuming. Regular spray of weedicides in that area can stop the growth of weeds. Another better option would be to add gravel or small size stones below the fence line with about 6-8 inches depth trenches. Pour burnt oil over this arrangement which can stop the oxygen circulation to this area which stops weeds from sprouting altogether.

2. Regular checks on the system is required. Twigs or other material that may fall on the fence can reduce its functionality.

3. Do a regular check for loose connections.

How do you ensure the efficiency of the system considering that all animals are different?

Considering animals are different, it is difficult to design. We have to study the movement of the animal, walking / movement style, intrusion habits when we design these fences.

Preventing elephant intrusion has been quite a difficult task. Elephant is also an extremely intelligent animal which makes our job all the more challenging. The moment it senses a power line, it searches for a neutral line and tries to pull it off. So, in our system we have the whisker system. This system carries two parallel wires with rounded edge so that it doesn't hurt the animal. This system enables the elephant to experience a shock 1 mt before it reaches the fence. We also have fence monitoring equipment. It is a neon tester that carries 5 lights. If all the 5 lights flashes, it means that the fence is in excellent condition. 4 lights flashing indicates very good working condition of the fence. 3 lights flashing indicates good working condition of the fence and less than 3 lights indicates need for attention. We also have a digital voltmeter which shows the actual running voltage on the fence. Another monitoring equipment we have is a Limelight, a xenon flash tube which sends out flashes in accordance to the energizer pulse. These light flashes can be viewed even at half a kilometer radius. These also help keep elephants away.

What is the cost per 1000meter of fence?

Assuming that the field is square or rectangular in shape, about 15 acres to 16 acres makes up for 1 km which is 1000 meters. For 1000 meters of fence installation, assuming that there are only 4 corners and 2 gates, the cost will be around Rs4.5L - 5L. This cost is inclusive of installation.

What is the cost of the base unit?

The energizer is the heart of the system. This varies from Rs.5000 for 1 J energizers to Rs.3.8L for a 100J energizer. In India, we prefer up to 10J which costs around Rs.45000/-. Along with all the other components, the system will come to about Rs.4.5-5L.





What is the life of the fence if it is well maintained by the owner?

It will last up to 15years minimum because we give galvanized posts. The solar panels and wires come with a 10-year guarantee because of the zinc coating. We have taken up a project in Uttaranchal with a 10-year AMC. It was handed over almost 5 years ago and till date it has been working fine.

What is the maintenance cost per year?

Maintenance cost is minimal. The solar panel, fence lines, energizer, etc. lasts for years. We guarantee energizer for 12 months from the date of installation. Battery is the only part which should be changed once in 3 years, even if it is maintenance free battery. Normally when there is no intrusion, there is no load on the battery.

Is there any Government subsidy available for this?

Off late, 2-3 states have come out with a subsidy system which is still in process. Earlier there was subsidy only for solar panels and subsidy they used to get was quite minimal because solar panel cost is less than 10% cost of the total system. Now, in some places of Tamil Nadu and Maharashtra government is offering 50% subsidy on the total cost of the system.

If it is 15-16 acres of land having about 1100 meters, they get up to about Rs.

2.8L as a total quote out of which they can get Rs.1.5 L as subsidy.

Is the pulsating current fatal?

It is not fatal at all. In medical terms, it requires up to 160-300 J for ventricular defibrillation to occur. The pulsating current is hardly 3 or 2 J which is wont even cause a discoloration on your skin. It gives a brief jolt, that's all. National and international safety standards are being followed. We now follow International (IE) standards and our equipment safety guaranteed.

Does this fence prevent monkeys from entering the farm?

For monkeys we will need to have a special design with multiple lines. The monkey has padded paws. Hence, we need to have post protection. The posts also need to be powered. That is how monkeys can be controlled. We have done many of these as well.

Can the fence be jumped over or can animals get tangled in it?

The height of the fence is around 6.5ft above the ground level. It comprises of 8 lines normally. Like I mentioned, animal habits are also being considered while designing the fence. Even if a dog runs and jumps it cannot go over 6.5ft. Since there is an 8 line configuration, there is no such gap provided for dogs to enter. Snakes, perhaps can crawl inside. The bottom line is given live and it has a coiling effect. Snakes do die because it will coil around and dies because of repeated shocks. But any other animals, from rabbits to elephants there is no possibility of getting affected by shocks or dysfunctionality of any parts of their body.

What kind of battery do you use?

It is a normal battery which ranges from 60AH to 130AH. We use tubular batteries which is recommended. But plate batteries also work excellently well. We do not transport batteries. We leave it to the grower's choice so that he can have local guarantee as well from the local dealer.

What should the minimum project size be for this system to be viable?

We even do 100meter fences. For smaller plots you will find the per meter cost more expensive. The base unit is the same which costs more thanRs.40000/-Rest of the items are of variable cost.

Do you have services in other states?

We have services all over India and we have dedicated dealers as well.

Is any government clearance required before installation of power fences?

No, it is not required. The forest department sees the necessity for such fences in agriculture. It is a system that benefits farmers and avoids man-animal conflicts which has been in existence since ages. We needed a way to keep the conflict rested without harm to either parties.

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How DST-backed agritech incubator Indigram Labs is ushering in a new green revolution

elhi-based Indigram Labs has incubated 35 agritech startups since 2016. In the next 10 years, it plans to back 100 more, and transform the entire farm-to-fork value chain in India.

It is a great time to be an agri-business in India. Although we've traditionally been an agrarian economy, with nearly two-thirds of the country's population earning its livelihood on farms, there is a renewed focus on the sector lately.

As a result, a host of agri companies have mushroomed in the last 24-36 months. They are using new-age technologies to improve crop output, better farm management, increase farmer incomes, eliminate pesky middlemen, and drive efficiencies in the entire farmto-fork value chain.

In a recent report titled Agritech in India – Emerging Trends in 2019, industry body NASSCOM estimated there are over 450 agritech startups in India today. In 2019 alone, the sector received close to \$250 million in funding, a whopping increase of 300 percent over last year. NASSCOM also expects India to have its first agritech unicorn in two to three years.

Incubators driving growth of agritech

Playing a critical role in the development of the sector are agri-business incubators. Delhi-based Indigram Labs is one of India's first private incubators focused on agritech and related businesses. Indigram even provides lab facilities, where startups can test their product prototypes before taking them to market. It has trained more than 4,000 youths in collaboration with the Indian Society of Agribusiness Professionals (ISAP).

Notable startups in Indigram's portfolio include Intello Labs (AI-based agro

commodity testing app), My-Crop Technologies (farm management system), AgriWatch (delivering market intelligence on agri commodities), Rowan Agronature (market linkage to farm produce and a credit platform), TechnifyBiz (managing the dry commodity supply chain), AgSmartic (farm management and smart irrigation), and Farms2-Fork (farm automation).

In a decade, Indigram plans to incubate 100 startups from across segments in agritech - crop input/output, farming techniques, tractors and farm equipment, food processing and grading, farmers' credit, cold storage and supply chain, and more.

The incubator, which Ashish says is "run like a proper business", recently tied up with the Department of Science and Technology (DST).

It has earmarked a corpus of Rs 10 crore for the same, and will elevate startups to a level where they can draw angel or institutional investors. The investment for each startup will be capped at Rs 25 lakh.

How Indigram incubates and what it offers

He adds, "All kinds of support are offered in-house. We have agronomists, supply chain experts, strategy experts,

consultants, and market intelligence people. We also have angel in-

vestors within the incubator."

> By the end of 2019, Indigram Labs is projected to be a 2,000-people organisation, making it one of the largest business incubators in the country.

Because of its vast network, it has gained a deep understanding of the variable farmer psyche in In-

dia. Indigram is currently 'active' in Maharashtra, Karnataka, Haryana, Punjab, and Madhya Pradesh across multiple agro-climatic zones.

Indigram reveals that setting up an agritech venture in southern states is "far more viable and sustainable" because state governments there are more lenient with subsidies. Also, in places like Karnataka, there are 10 different agro-climatic zones where "you can grow almost everything" - from betel nuts and spices to black pepper and coffee. "Farmers in the south are more organised too," Ashish observes.

Source : yourstory.com



Mugilan Thiru Ramasamy

CEO and CoFounder Skylark Drones Bangalore, Karnataka

rones have been around for 50 years now. In the last one decade is when we have been looking at it from a commercial application stand point. With respect to regulations, we are working very closely with the Indian government and we believe drones have started invading everybody's life slowly but steadily.

Drones come in various sizes and formats. They can be very large which can cover about 300 acres in one single flight or they can be small ones employed for photography during functions. Potentially they can also help in covering small acres that is between 50 to 100 acres. For a drone 50 acres is a small piece of land. Agriculture can be divided into 4 steps - Planning - Detect -Manage – Assess and drones have a role to play in each of these stages.

"We have worked with a lot of seed companies in their planning phase. If you want to find out which area you want to partner up with a farmer or if you want to do a complete flood risk assessment of the region etc. drones can come very handy. You can give a drone a flight over the entire village and across villages to determine the entire hydrological map of the area. You get information about where the water tends to aggregate, where it won't, which area has a slope etc. The turnaround time for this report is less than a week. So, it is a quick turnaround.

With this map, you can plan where your seeds can be sown. You can also plan the intercropping distance based on the shadow of the nearby trees. It gives a very good indication of how many seeds can be sown in 1 acre of land. We are not talking in kgs or grams, it gives you a count. Once the plant starts growing, there are ways in which you can figure out what is the weed detection of different regions of plants. Once you fly the drone early morning you will know which part of your farm is weed infested and which is not and also the health of the plant. This is done by chlorosol identification.

You can also count the amount of plants on the farm. We did a project for Syngenta Seeds - a local seed company wherein we helped them count all their plants in their Andhra region with 90% accuracy. We could identify that in 35000 seeds, 34000 germinated and 1000 seeds didn't germinate. Such things can also be detected using drones.

We can also determine soil quality of regions and the correlation between the soil quality and plant mix on the farm. These are geo-specific insights

Using a thermal camera, we can also detect where the water is on our farm. That is, we can detect the moisture across farmlands. We can also detect which area needs to be watered and which cannot. These are all useful when we have large acres of land. We can also detect things like plot to plot distances, how many male vs female plants. We also help during natural disasters. By flying dones, we can see which areas have got damaged and to what extent. Government can use this information to plan out their schemes and rescue missions."

Is the count based on the number of seeds or do you take the input from the photography?

The count is only based on the images the drone generates.

Do you supply drones or do you offer drone-based services?

We have partners who supply drones. We build software for drones. We build applications based on customer needs.

We do not manufacture drones. If required, we have a pilot network in India. If you have a one-time requirement for flying drones on your farm, we can arrange that for you as well.

Will you be able to advise what is the



Skylark Drones - Drone Analytics for Increased Productivity



best type of drone suited for a particular farm?

Yes, I can do that.

Is there any Government permission required to fly drones on one's farm?

We are working with the regulatory bodies. Once you purchase a drone, you have to register in the digital sky portal which is set to go live in October-November timeframe. This is the Central Government norm. There are no other regulations at the moment.

What is the approximate cost?

Cost depends completely on the type of drone. Imagery drones will cost about 1L - 1.5L. Spraying drones may cost you about Rs.6L-Rs 8L.

Do you provide any training for flying drones?

We are partnering with a person to offer trainings. In the next two months, we should begin drone pilot trainings. We have a large field near Bangalore and we plan on offering training sessions over there.

Can we possibly integrate drone technology into automated irrigation systems?

This calls for an elaborate discussion. We can take this offline, discuss and come up with a possible plan.

Other than soil moisture, what other soil parameters can a drone reveal?

The drone doesn't do any of this. While the drone takes flight, it is the sensor that transmits the input to the system. Even satellite maps have all these sensors. The only difference is that satellite is for larger areas, whereas drone are capable of giving values at a plot level because sensors are closer to your plot. We can mount multiple sensors into a drone. We can mount multi spectral sensors, thermal camera, normal visual camera, etc. It is up to you what parameters you want to detect. For example, a multi spectral camera might detect different crop varieties. Thermal cameras can detect irrigation since water has different temperatures as compared to plants. So, the possibilities are multifold.

Have you done any spraying using drones in coffee estates so far?

No, not yet. We have worked on some plants for the contours of some plantations. We haven't done spraying activities.

What is the minimum land area to make use of this technology viable?

It depends on the use case. If it is for spraying, it makes sense to do it even for 1 acre. If you are looking for imaging it makes sense if you have larger plots of land like 10-20 acres or more, even if it is not plots at a stretch. Drones bring in efficiency on larger areas.

How is the seed spacing calculated

using this technology?

Once you get a piece of land, first thing is you need to find out how many plants you can have on that plot for efficient cultivation. Once a drone is flown over your area, you can accurately determine the length. breadth etc. Most plots may not be accurately rectangular but using drones you get accurate plot dimensions. You can then possibly think in terms of the number of plants you can cultivate if you were to sow, for instance, one seed in every 5cms. After planting those seeds, you can fly the drone after another 5 days and see if the germination is happening. That will give you a clear indication of the spacing that actually effects germination. This is useful when you are managing about 500 -600 acres distributed as sav 2 acres land. This means you have 150 plots. It is almost impossible to check, without drones, if people have followed your seed plan across 150 plots.

How many people are into making of drones in India?

There are about 5-6 people manufactur-



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ing drones in India. 90% of the drones are imported from China.

Can we have drones to function like CCTV cameras to monitor remote-area plots?

Yes, we have this solution ready. We are to pilot it with NECO seeds (check Google) in a couple of weeks. We have with COVID in the past. We can definitely monitor plots remotely. You can sit at your laptop, fly a drone and monitor what your labor is doing on the farm.

How much would such a convenience cost?

Other than the drone and pilot costs, we would charge about Rs.25,000 per month. It comes up to the payment you would pay to a security guard. The cost reduces with larger plots of land.

Will the drone be operated manually?

As per current regulations, drones should be manually operated although the actual operation is just to click a button. There is no skill required but owing to regulation, it calls for a person to be there on the field for this purpose.

Does drones have the capability of counting the yield / size of the fruit etc. on a tree / plant?

I would say no. For example if it is a mango tree it will depend on whether the mango can be detected etc. Once you start flying a drone, it is hard for you to check out the branches of a tree because it is not possible for drones to pass through branches. Not just that, fruits etc do not grow in any particular pattern. Hence it is not a pragmatic solution. Now, post harvest, if the mangoes are in a heap, you can count the mangoes using a drone. In the sense, you can measure the volume of the heap and estimate the number of mangoes in the heap. Having said that, we can do yield estimation accurately for corn, chillies, etc small shrubs.

What are the two biggest limitations of drones in agriculture?

1. Unless you have a large plantation, doing this right now may not be economically viable for most farmers. Having said that it is highly useful for seed companies and larger farm organisations.

2. Besides that, today the regulations are getting clearer by the day. Perhaps by the end of this year more drones will be up in the air than ever before. We foresee that in 10 years we can see about 10 million drone flights a day. That is the potential.

Can drones replicate pollination, especially for seed companies?

There may be small drones, but I don't know how successful they have been. The challenge really is that they should perhaps be manually operated. Also, I am not aware of how exactly pollination works.

How can you ensure safety of birds and



human beings when using drones?

Drones usually have anti-colliding programmes built into them. They wont collide into anything. When the drones battery is low, it can fall from the sky. There are ways in which we try to avoid such situations. We are trying to ensure that when a drones' battery drains, it automatically flies back to where it is stored.

Do you have a drone that can currently be used to scare birds off the orchards?

No. That kind of drone would be some sort of noise-making device which keeps birds away. These devices are mounted on drones to keeps birds away. We don't currently sell those devices.

What is the cost of drones employed for agricultural spraying?

It would come to about Rs.6L-8L. It depends on the quality of the drone. Chinese drones have lot more sales across the world than any other.

How much time would it take to spray

about 10 acres of land?

Spraying may take about 1-2 hours per acre. Then there may be the case that you have to travel between regions. So, that should also be taken into account, So, it may take a day or day and a half. It all depends on the drone capacity - if the drone has 5L or 10L capacity payload and the geographical location and topography of the land. Also, it depends upon if the land is in one place or fragmented.

Can drones be used in coconut farming?

I dont think so. It isn't a robot level gadget yet which can be employed to harvest coconuts. For that it will require robotic arms which is not a reality yet.

Can a drone carry a man while flying?

That is like an air taxi which is again not a reality now. We may see progress in the next 5 years perhaps. I know that there is a startup at IIT Madras who is researching on this.

Was there ever an extra ordinary outcome by using drone technology?

I am not sure how to define extraordinary. Whenever you fly a drone,

you can detect multiple things and this has helped entrepreneurs in so many multiple ways. Other than in the field of agriculture, we work with solar, mines, etc. We work quite extensively with TATA mines and Ultra Tech Cements for their volume estimations etc. We work with construction, real estate companies in their excavation report. So, we make things simple and accurate so that in multiple industries, work can be more effective.

What is the range and flight time for larger farms and will the battery be able to withstand longer flights?

Battery should not be a problem. Drones seen at weddings can be flown for 1 -2 kms at a stretch. You can always keep replacing batteries. We should have multiple batteries with us. The drone will come back to you if the battery gets weak.

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Farming's grand challenge

How to feed the world sustainably?

With 10 billion mouths to feed by 2050, global agriculture must transform itself through innovation and digital technology – and help to build a carbon-neutral future for the planet.

t is hard to understate the challenges the world faces. Emerging from the throes of the pandemic, global governments must grapple with a climate crisis whose signs are everywhere marked by weather extremes, be it floods, heatwaves or hurricanes.

At the centre of this mega-challenge: global agriculture. Faced with the devastating effects of climate change, the industry will need to transform in order to produce sufficient healthy, diverse and safe food for a rapidly growing world population; and it must address its own impact on the environment – more than one-quarter of the world's greenhouse gas emissions come from agriculture, forestry, and land-use change.

At the same time, caloric demand is expected to increase by 70 per cent by 2050, while it is feared that the water supply could fall 40 per cent short of meeting global water needs by 2030. So what can be done to produce more under changing conditions and with less impact on the environment?

"Food production and environmental protection must be treated as equal parts of agriculture's grand challenge," said David Mortensen, Professor of Weed and Applied Plant Ecology at Pennsylvania State University in a research study conducted by the university."

This will entail a massive collaborative effort, says Liam Condon, President of Bayer's Crop Science Division. "It will involve all sectors of the industry working together to accelerate innovation, develop business models that reward sustainability, and put data and insights at farmers' fingertips with cutting-edge digital tools," he says.

The agriculture industry has some track record on this. For instance, the adoption of insect-resistant and herbicide tolerant crops – developed with the help of biotech – has facilitated important cuts in fuel use and tillage changes, resulting in a significant reduction in the release of greenhouse gas emissions. In 2018, this was put at the equivalent to removing 15.3 million cars from the roads.

"Agriculture can meet this challenge through ground-breaking innovation – and not only feed a growing population, but also be part of the solution to climate change," says Condon. But while Bayer invests heavily in its own research and development – its annual Crop Science R&D budget is two billion euros, the largest in agriculture – unlocking the necessary scale of innovation must be a collective effort.

As such, Bayer is partnering with start-ups, established companies and academia to realise the potential of emerging technologies in tackling agriculture's grand challenge. Through Bayer's investment arm Leaps by Bayer, a joint venture with Ginkgo Bioworks is using synthetic biology to engineer microbes that can provide plants with biological nitrogen fertiliser, decreasing the environmental impact of agriculture.

Vertical farming is another solution with promise to transform sustain-



able methods of growing fruit and vegetables. A single vertical farm can grow four hectares - roughly five Olympicsize swimming pools - worth of food on less than half a hectare of land, making it ideal for urban areas and helping preserve more space for biodiversity. There are 2.2 million square feet of indoor farms worldwide, but that is predicted to increase almost tenfold to 22 million square feet within the next five years. Bayer has collaborated with investment company Temasek to form Unfold, a company whose focus is to develop vegetable seeds for vertical farming with optimised quality, efficiency and sustainability.

While technological innovations undoubtedly have the potential to improve agricultural practices and make them fit for a carbon-neutral future, farmers are the 'beating heart' of the industry and their cooperation is crucial. Farmers are stewards of their land and already use climate-smart practices like cover crops and no-till farming, which helps the soil retain water and boosts soil health. And soil is one of the most effective ways to sequester carbon.

Traditionally, farmers have been rewarded solely for the crops they produce, but that is changing. In the US, the new, Biden administration wants to steer \$30 billion in government farm aid money to pay farmers to implement sustainable practices and capture carbon in their soil. The movement has seen increasing support from private companies too. Bayer introduced a Carbon Initiative programme in the US and Brazil last year, making them the first company to take a science-based, transparent and collaborative approach to rewarding farmers for adopting climate-smart practices that help sequester carbon in the soil.

Meanwhile in Europe, the World Economic Forum CEO Action Group has launched the European Carbon Farming Coalition aimed at enabling a decarbonised European food system. As Liam Condon of Bayer points out, building climate-smart solutions in Europe requires a science-driven, on-farm carbon accounting framework.

Read full articles @ https://bit. ly/2OoPhbC

Source : bayer.ft.com



'Farms are going to need different kinds of robots'

n a lush, green patch of rolling farmland in Australia's Queensland, cows are quietly grazing in a scene that is replicated around the world. A closer inspection, however, would reveal that these particular bovines are a bit more high-tech than normal.

Behind one ear, each carries a device roughly the size of a matchbox - a tamper-proof, solar-powered, satellite-connected smart "tag" that is constantly transmitting real-time data back to the farmer. "It tells us where the animal is with GPS, and also what condition the animal is in," explains David Smith, the chief executive of Ceres Tag, the Brisbanebased firm behind the technology.

"We have a very sophisticated algorithm for things like pasture feed intake, so we know what the feed efficiency of the animal is. From that, we can start making some genetic selections." These tags - which also monitor rumination, or re-chewing, levels, and other health and fitness factors - are just one way in which the latest technologies are finding their way into agriculture.

From autonomous harvesting robots and drones that can spray crops, to artificial intelligence, and the use of "big data", farmers around the world are turning to high-tech solutions to address issues ranging from food insecurity, to climate change, and pandemic-induced staff cuts.

Collectively, this increased use of technology in agriculture is known as "precision farming", and it is a booming industry. One report suggests that its global value will reach \$12.9bn (£9.1bn) by 2027, with average annual growth of 13% between now and then. "Technology is transforming the world of agriculture for the better," says Stephen Fagan, head of operations at Irish firm Moocall. It produces a smartphone-connected sensor that fits to the tail of a pregnant cow, and sends the farmer a text message when the animal is approaching calving.

This enables the farmer to be productive doing other things, and then get to the cow on time, rather than have to wait with her for an extended period. "We are learning more than ever about ways to improve efficiency on farms, and in turn, improve overall profitability," adds Mr Fagan. "Nobody wants to remove the human factor, or relationships that farmers build with their livestock. But on the other hand, if a technological solution can make life a lot easier by

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reducing labour time, human error and general hardships, then farmers will take advantage of that solution without question."

Among those at the forefront of studying the impact of increased technology on the future of farming is Prof Girish Chowdhary, the director of the Distributed Autonomous Systems Laboratory (Daslab) at the University of Illinois at Urbana-Champaign. He says that largely autonomous farms are just over the horizon. Already, many emerging technologies, such as robots that can monitor the health of crops, are being put to use at Daslab's research fields.

"A farm is going to need different kinds of robots," says Prof Chowdhary. "Some of them are going to be very small... others are going to be big, perhaps even as big as combine harvester. There will be an autonomous system that is coordinating this team of robots, telling them what they need to do in order to get different tasks done." In addition to robots, Prof Chowdhary says drones will be increasingly used. "Drones are really good at covering a lot of space," he says. "They can go somewhere and spray some-





thing, or take a picture, really quickly."

Proponents of technology in agriculture also note that these innovations can be used for the benefit of the developing world. TechnoServe, for example, is a US international development, not-for-profit organisation that uses remote sensing, drone mapping, machine learning, and satellite data, in a bid to boost cashew nut production in the West African nation of Benin.

Cashews account for 8% of the country's export earnings, and TechnoServe is helping farmers know where best to plant their trees, and to increase both the quantity and quality of their yields. The organisation already has plans to replicate the project across West Africa and in Mozambique.

TechnoServe director Dave Hale says they can "identify [sites for] cashew farms with a high level of accuracy".

"[And] with improved agricultural practices, farmers then increase their productivity and their incomes."

Globally, the coronavirus pandemic, and the empty supermarket shelves at various points of lockdown, has increased concerns about food shortages. Some tech firms are turning to technology to help ease these fears. "Covid revealed how vulnerable our food supply is. It revealed how fragile our logistics system is," says Dr Nate Storey, the co-founder and chief science officer of a US firm called Plenty.

His business utilises AI and software to create scalable, indoor "vertical farms" capable of growing multiple vegetable crops on tall walls. Plenty aims to help relieve pressure on traditional farming as the amount of available agricultural land goes down, and the world's population - and demand for food - is rapidly rising. The world's population is expected to increase from 7.7 billion currently to 9.7 billion in 2050, according to the United Nations.



"Ultimately, agriculture will need to become infinitely sustainable," says Moocall's Mr Fagan. "I think everyone can agree that as long as humans are on the planet and need food, farming will be at the core of that. But farms need to be viable." In the long term, the urgency of improved farming practices and the turn to technology to solve these issues may have another important economic benefit - job creation. "I think we're going to see a new influx of people to agriculture," says Dr Storey. "Agriculture has been ageing for a while, and it hasn't been ageing particularly well.

"Producing food is one of the most honest and straightforward things you can do for this world. In a complicated world, it's an uncomplicated act.

"Empowering people to do that with technology is going to be really meaningful for a lot of people, both in terms of quality of life for consumers, and quality of life for producers."

By Bernd Debusmann Jr

Souce : www.bbc.com



Question

01

 $Q_{a}A$

INTER CROPPING OPTIONS IN EUCA-LYPTUS FARM? setril: A friend of mine has a three acre three year old

eucalyptus farm but the growth of the plants was not upto the mark as he is having a regular job and couldn't provide sufficient time to farming. Now he wishes to plan for inter crops between the eucalyptus plants simultaneously as he got work from home option for some months due to covid. So, any guidance by experienced people with inter crop knowledge could be helpful.

Answer I -- garao56: Generally no inter crops are raised in Eucalyptus plantations under rain fed cultivation . Under irrigated conditions if space between plants is 14×2 meters inter crops such as turmeric, ginger, wheat , sugarcane, banana etc can be grown.

setril:Thank you for the information, it is on irrigation basis and not rain fed cultivation, but not sure of the spacing between plants.

Answer 2 -- garao56: Generally Eucalyptus plants spacing is 8 x 5 feet in which tractor can be moved for inter cultivation getting 1000 plants per acre. In case of inter cultivation more space is required. Farmers rarely taking up inter cultivation in eucalyptus plantations.



NEED GUIDANCE TO START-UP HOR-TICULTURE FOR SOUTHERN KARNA-TAKA

dadsdream:Hi, this is Sreenivas, planning for horticulture cultivation. I have a piece of land which measures about 4 acres and has ample free time (3 days in a week to be precise), I am planning to rejuvenate the land. Please share any relevant information on what I can do with that land. All kinds of suggestions are welcome. Thanks in advance

Answer I – garao56 : Dear Sir, Please inform hitherto what are the crops/fruit plants taken up on the land. If new development is to be undertaken you have to develop the land by providing the following developmental activities.

I. Jungle clearance 2. Leveling 3. Bund formation 4.Development of well/Bore well 5.Pumpset 6.Fencing

6.Farm house /worker's quarter 7.New crops/Fruit crops proposed to planted on the land

Please inform the above particulars to enable us to prepare project report for availing any term loan from Banks

Answer 2 – dadsdream: It was previously cultivable land, left uncultivated for 4-5 years and there was a dried-up small river, which has been filled up with trees and bushes and topped up with mud about 3 years ago. The average rainfall is about 250-400 mm per year. I have borewell with about 2.5-inch water output. Answer 3 – garao56 : Please take up land development like fencing, leveling, bunding, filling with earth etc and take up plantation of fruit crops. which type of fruit crop you are interested please inform to guide you

Answer 4 – purnachan: Sir, where exactly is your land located?

We can guide you in setting up a profitable horticulture farm in less than 2 months



Answer 5 – **kskarnic:**Please provide location of the land available facilities on site like irrigation facilities farm animals topography of the land existing crop or is it Barn would you be a absentee landlord or stay at the site. Availability of labour. Nearest market and any other information about the land status etc. All these information is essential to suggest activities that can be taken up

without hassles.



sumukha:Namaste, I need both inputs as well as raw materials to start a vermicomposting project in I-2 Acer land near Bangalore (Magadi). Looking at a trial project and want it to be inexpensive to start with until I feel confident and comfortable doing it in ef-



fective, efficient and methodical way. The farm already consists of 100 coconut trees, 50 mango trees and 100 silver oak trees. Can any of the leaf from these plans be used as raw materials? Thank you in advance for your inputs and support.

Answer I — vtnaren : Hi, I have a team which undertakes vermicompost training. I have been involved in training more than 5,000 farmers across Karnataka. Please give your contact details,

Answer 2 - garao56 : Dear Sri Sumukha, Please contact nearby

dairy farms for supply of cow dung for vermicomposting the leaf material and other debris available on the farm is limited supply.

If you are taking up the vermi-compost unit please approach us for project report for availing loan from bank. Also subsidy can be availed from KVIC under the PMEGP scheme



Answer 3 - spbrar: I would like to know a first hand input on the vermi-compost setup and avail financial support form government scheme. please share your contact details to speak direct. regards,

Answer 4 - purnachan : Sir please visit GKVK, Bangalore-65 It is a Government Institute.



COLOUR CAPSICUM

gopipc : I would like to explore cultivating Colour Capsicum. We have an acre of farm in Punganur (near Bangalore) which has climate similar to Bangalore. Is it possible



to cultivate color Capsicum in open land? If not, would Shade net be sufficient? What would be the approximate cost (for I acre) - both initial capital cost as well as monthly recurring cost? What would be the approximate yield per acre? Is Bangalore a ready market for colour Capsicum?

Answer 1 -- garao56 : Better to establish shade and cultivate to avoid pest and diseases



NEED ALOEVERA CULTIVATION& MARKET-ING DETAILS

recharla9:Need ALOEVERA Cultivation& Marketing details Sir, Am interested in aloe cultivation and export. I come from" Pakala Mandel, chittoor(DT) and hra pradesh, india" which has an ideal weather for its cultivation. . I have own land of 5 acres. Please give me the ideas of cultivate & export of aloe vera, Kindly assist me with the logistics of its export and buyer and how much investment needed to do this business.



Answer I -- vrikshaay : Already there is over production of Aloe vera in India. And is cultivation in small area like 5 acres is not at all feasible. Only if you have a ready buyer/processor within 100 KM it will be feasible as the leaf has to be processed soon after harvesting/ cutting. There is no potential for export of fresh leaf. only

processed products are exported. Setting up processing facility for 5 acre production is also not feasible. And any single crop farming is high risk and not feasible under any circumstances. It will be better for you to consider multi crop/multi herbs cultivation. We provide complete consultancy for High Value Crops Organic Multi Cultivation projects.



CONSULTANCY REQUIRED FOR FARMING

TS:Hello All, We have 10 acres of land within 30 KM from Bhubaneswar, Odisha. We are exploring options to start a farming project very soon and basically interested in Floriculture/Horticulture/Green House farming. Experts or Consultancy, Please contact me. shrushti:We provide Turnkey Project in Green house, , Climate control Green house, Shade net house, Farm Pond & provide further technical Support etc. Erection of project on Turnkey basis from design stage up to final production. Plantati on of selected crop & support to our comprehensive Technical Assistant.

Greenhouses and other technologies for controlled environment plant production are associated with the off-season production of Flowers and vegetables of high value in cold climate areas where outdoor production is not possible. We provide agricultural consultancy by our highly professional dedicated team of the agro technologists.

Answer 1 -- garao56:Please contact us for project report for availing Subsidy from NHB

Answer 2 -- vrikshaay : We provide complete consultancy services for farm projects to be based on Integrated Green Farming (IGF), Vriksha Ayurveda, Spiritual and Sustainable Organic Farming (VASSF) with High Value Crops Multi Cultivation (HVCMC).

Answer 3 -- rcdixit : You may contact Indian Medicinal & Aromatic Plants Trust Lucknow for needful. They can also provide you with organic Megha-I variety turmeric tubers containing 7.5 percent curcumin contents. Another variety with 12.5 percent curcumin 'pitambri' developed by CIMAP also available with them. Rate Megha_1@ 400/- per kgs.Pitambri @ 1500/- per kgs.

Answer 4 -- subhajit: Hello, You can contact us for all the services you mentioned above.

REGARDING MIXED CROPPING OF COCO-NUT PLANTS WITH ARECANUT PLANTS

abhi 1994 : Friends I have 2 acres of land in my Village in



mysuru district I have plans to do mixed cropping of coconut and arecanut plantation so anyone here plz guide me the best method to this plantation, I hope to get best replies as soon as possible friends

Answer I -- sriramsree : kindly approach nearby KVK institute, they can support you about subsides and other assistance.

Answer 2 - venudvg2010 : Don't go for Areca nut. Instead of that you can plant Mahogany which can give you good returns in 8 - 10 years. Don't waste your resources. This is my opinion. You can contact me for further discussion.

MEDICINAL PLANT CULTIVATION

rajmohana: I have 10 acres of agriculture land in Thanjavur Delta region. Good fertile clay soil, presently cultivating paddy. Please guide in alternative cultivation like medicinal plants.



Answer 1 -- garao56 : Please inform whether your land is free from water logging condition ie., wet land . Medicinal plants thrive well under dryland conditions . Please have tie up with any herbal processing companies before taking up cultivation of medicinal plants. G.Anandarao B.Sc (Ag)

Answer 2 -- noahpatt: Thanks, that is exactly what I wanted to know.

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SANDALWOOD CULTIVATION 12farmer7:Hi, I'm interested in Sandalwood Cultivation and looking to know more about same. Could someone please inbox me with details if have first hand info doing, have couple of naive queries.Thanks.

Answer 1 -- garao56 : Please inform the location and number of acres of land to be brought under cultivation. For further inquiries please contact us for guidance and project reports.

12farmer7:Hi Sir, Thanks for prompt reply. Im considering cultivation near by Madanapalle, AP-517325 location. So far, i haven't bought any land, but have plans go for 5-10 acres.

Please let me know the kind of land i should be selecting for cultivation and if cultivation can survive in said locations climate.

Also, should i be planting host tress in advance before going for sandalwood plantation? If so, How many months before host trees needs to be planted. Also, which would be good host plant for said location?

Answer 2 -- garao 56: Well drained red soil type is better. Right from seed dibbling we have to plant Redgram plant as host in the same polythene pouch till tranplantin on the main field.

I 2farmer7:Hi Sir, Thanks for your reply. If i would like to buy Plants from Nursery, what should be age of the plants i should go for to increase the chances of survival after plantation?

Also, after plantation in main land, which would be the best/good host? Should we plant host in advance to Sandalwood plants? if so, how long before host plantation needs to be done.

Answer 3 -- shanmuga06 : The healthy and very opt for planting the sandalwood will have the following conditions like one year old ,(the seed also belongs to RooT-I),the height of the sandalwood seedling will be one and feet height with black stalk rich green leaves. Any kind of cultivation as well as plantation please note the selection of seeds/seedlings vital role .



MIXED CROPPING OF COCONUT PLANTS WITH ARE-CANUT PLANTS abhi1994:Friends 1 have

2 acres of land in my Village in mysuru district I have plans to do mixed cropping of coconut and arecanut plantation so anyone here plz guide me the best method to this plantation,

I hope to get best replies as soon as possible friends



Answer 1 -- sriramsree : kindly approach nearby KVK institute, they can support you about subsides and other assistance.

Answer 2 -- venudvg2010 : Don't go for Areca nut. Instead of that you can plant Mahogany which can give you good returns in 8 - 10 years. Don't waste your resources. This is my opinion.

ORGANIC FARMING ON CULTIVABLE WASTE-LAND

vibhus: Dear Experts, 1 need-

ed some advice on the feasibility of doing organic farming on cultivable wasteland. Please find below my questions-

. Is a cultivable wasteland in a village lying idle for 3-5 years a good option for organic farming?

2. What will be the steps required for land preparation? How will they be different from the steps of regular agricultural land?

3. Since there has been no chemical farming on the cultivable wasteland for for more than 3 years, will the organic certification can be availed early after the restart?

4. What can be the prospective lease price for an acre of cultivable wasteland?

5. Will there be a big difference in the production cost on cultivable wasteland compared to regular agricultural land?

6. Any other relevant information you want to share.

Answer I – ecojobsin: I.Yes.

2. Depend on land/soil and atmospheric characteristics, and the crops planned.

3. Yes. It will be easier to get certification as there is no chemical history to be corrected.

4. Lease rate depends on location, infrastructure and other relevant factors applicable.

5. Cost depends on what you want to cultivate, the present conditions of land/soil and atmosphere, water sources and supply arrangements, and other infrastructure required etc.

We provide complete consultancy services for Organic Farming projects with High Value Crops, in all types of land and all climatic locations.

FCO CERTIFICATE

lalitvashista: We are a Process Engineering company . We have tried and tested very high grade Ortho-Silicic Acid (OSA)-Based Plant Stress Manager & Immunity Booster. To



sell in the market we need an FCO certificate. Can anyone guide us through the Application process for Maharashtra.We are interested to hire a consultant who can give us this service.

Secondly we have some more Organic Fertilisers and Insecticides for different crops, improving plant health and also increasing yields per Hectare.. We want Dealers and Distributors to contact us so we can share the product range.

Answer 1 – garao56: You are advised to approach the Asst.Director of Agriculture, locally for FCO particulars.

AGRICULTURE INFORMATION Connecting Growers, Buyers & Experts



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