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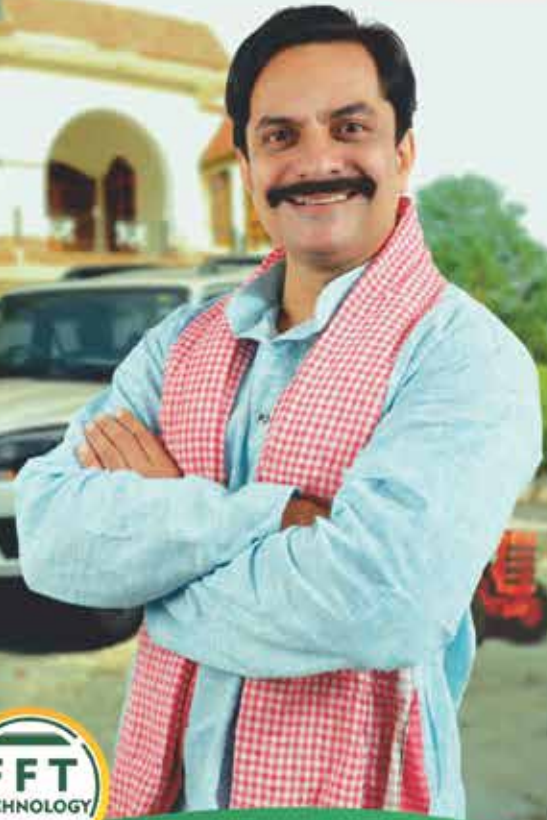
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Budget 2024 for Farmers

Agriculture industry wants FM to hike PM Kisan installment amount to Rs 8,000 in budget

During the recent pre-budget discussions, agricultural experts met with Finance Minister Nirmala Sitharaman. According to news reports, they have requested the FM to increase the PM-KISAN installment amount from the current Rs 6,000 to Rs 8,000 annually in Union budget. They have also asked for all subsidies to be given directly to farmers through direct benefit transfer (DBT), as well as additional funds for agricultural research in Budget 2024.

PM Kisan Samman Nidhi : On February 24, 2019, the PM-KISAN scheme was introduced to help land-holding farmers meet their financial requirements, provided they met specific income-based exclusion criteria.

PM Kisan scheme benefit : Eligible farmers' families nationwide receive Rs 6,000 annually, paid in three installments every four months via Direct Benefit Transfer (DBT), under the PM Kisan scheme.

More than 11 crore farmers nationwide have received payouts totaling more than Rs 3.04 lakh crores up to this point; with this disbursement, the total money paid to beneficiaries since the program's launch will surpass Rs 3.24 lakh crores.

In fact, after taking charge as the prime minister for the third time, Narendra Modi's first decision was to release the 17th instalment of the PM Kisan scheme to eligible farmers. The installment benefits 9.3 crore farmers and involves the distribution of around Rs 20,000 crore.

"Ours is a Government fully committed to Kisan Kalyan. It is therefore fitting that the first file signed on taking charge is related to farmer welfare. We want to keep working even more for the farmers and the agriculture sector in the times to come," PM Modi said in a statement.

The PM-KISAN scheme is a central sector program that provides income support to all landholding farmers' families in the country. This support is meant to supplement their financial needs for purchasing agricultural inputs and meeting domestic expenses.

The government has allocated a budget of Rs 1.27 lakh crore for the Ministry of Agriculture for the 2024-25 fiscal year, slightly higher than the current fiscal, according to Interim Budget documents.

How eligible farmers can register for PM Kisan?

Step 1: Visit pmkisan.gov.in

Step 2: Click on the option of Farmers Corner

Step 3: Click on the 'New Farmer Registration' option

Step 4: Select Rural farmer registration or urban farmer registration

Step 5: Enter Aadhaar number, mobile number, select state and click on 'Get OTP'.

Step 6: Fill in the OTP and proceed for the registration

Step 7: Enter more details such as select state, district, bank details and personal details. Enter your details as per Aadhaar.

Step 8: Click on 'Submit for Aadhaar authentication'

Step 9: Once your Aadhaar Authentication is successful, enter your land details, upload your supporting documents and click on save.

You will receive a message of confirmation or rejection on your screen.

If any member of the family is income tax payee in last assessment ear, then the family is not eligible for benefit under the scheme. In case of incorrect declaration, the beneficiary shall be liable for recovery of transferred financial benefit and other penal actions as per law.

Source : <https://economictimes.indiatimes.com>

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Amid better monsoon, kharif sowing in 2024-25 up 10% year-on-year to 57.5 million hectares



The growth in acreage alleviates concerns about a surge in food inflation, which has been more persistent than headline inflation in recent months.

15 July, the sowing area for sugarcane increased to 5.76 mh from 5.68 mh in 2023. Similarly, the sowing area for cotton increased to 9.57 million hectares from 9.3 mh in the same period last year.

Kharif sowing activities will continue till the end of September.

The area under cultivation in the 2024-25 kharif season has increased by 10.3% year-on-year, reaching 57.5 million hectares (mh), following better monsoon rains. At 57.5 million hectares, or 53% of the normal sown area, the combined sown area of key kharif crops such as paddy, pulses, oilseeds, sugarcane and cotton, is up 10.3% year-on-year, according to data from the agriculture ministry released recently. This alleviates concerns about a surge in food inflation, which has been more persistent than headline inflation in recent months. The growth also reflects the efforts and favorable conditions supporting farmers across the country.

Adequate rainfall : So far, monsoon rainfall this year has been 2% below the normal benchmark. According to the India Meteorological Department (IMD), West Bengal and Bihar have received adequate rainfall, while Odisha, Jharkhand and Chhattisgarh have witnessed below-normal monsoon rainfall.

“The increase in kharif sowing area is a promising indicator of the sector’s resilience and adaptability. The expansion in key crop areas like paddy, pulses, and oilseeds highlights the efforts of the agricultural community and the support provided by various initiatives and favorable weather conditions,” said Dr Anand Vishwakarma, project coordinator, All India Coordinated Research Project (AICRP) on Sesame and Niger, Jabalpur.

Source : <https://www.livemint.com>

Crop sowing : The area under paddy, or rice, the main kharif crop, increased by 20.75% from a year ago, reaching 11.56 million hectares (mh). This rise in paddy cultivation is encouraging due to the crop’s importance to food security and its role in the diet of millions of Indians.

Pulses also witnessed a notable surge, with acreage growing by 25.89% to 6.2 million hectares, according to the data. tur (arhar) alone accounted for 2.8 million hectares. The pulse varieties include tur, urad and moong. Growth in pulses cultivation is significant in light of the country’s efforts to boost production of protein-rich crops to meet domestic demand. Similarly, the area under oilseeds recorded remarkable growth of 22%, reaching 14 mh. This is likely to enhance production of edible oils, reducing dependence on imports and supporting the domestic industry.

Groundnut sowing area remained stable at 2.82 million hectares till 15 July, while soybean sowing area grew from 8.2 million hectares during the corresponding period in 2023 to 10.8 million hectares, while sunflower sowing area grew from 0.034 million hectares to 0.051 million hectares in 2024. However, the trend was not entirely positive across all crop categories. The area under millets, or coarse grains, declined by 7% from a year earlier, totaling 9.7 million hectares (mh). This is concerning, considering that 2023 was observed as the International Year of Millets. Millets are valued for their nutritional benefits and resilience to adverse climatic conditions. According to agriculture ministry data, as of



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President Murmu launches Bihar's 4th agri road map budgeted at ₹1.62 lakh crore

President Droupadi Murmu urged Bihar's farmers to take advantage of the rising demand for organic products and stressed that climate resilient agriculture can play an important role in tackling the challenge of climate change.

She was addressing a gathering after launching the fourth edition of the agricultural road map in the state at the Bapu Sabhagar auditorium in Patna.

Murmu, who arrived in Patna on a three-day visit to the state on Wednesday, spoke about implementing the three agriculture road maps in Bihar since 2008, which have increased the state's productivity in several crops including paddy, wheat and maize and the state also leading in the production of mushroom, lotus seeds, honey and fish.

The fourth edition of the agricultural roadmap launched today will be implemented with total expenditure of ₹1.62 lakh crore in various schemes, projects from 2023 to 2028. Crop diversification, increasing production of oilseeds, millets, seeds production are the major sectors in focus in this current edition of the road map.

Among those who attended the function were Governor Rajendra Vishwanath Arlekar, Chief Minister Nitish Kumar, deputy CM Tejashwi Prasad Yadav besides farmers and top officials of the state administration.

"Farmers of Bihar are known for striving and adopting new experiments in farming. This is the reason why a Nobel prize winner called the farmers of Nalanda 'greater than scientists'," Murmu said, adding that the state's farmers have preserved the traditional methods of agriculture and varieties of grains. "It is a good example of the harmony of tradition with modernity," Murmu said.

Referring to challenges of climate change and global warming, Murmu

Crop diversification, increasing production of oilseeds, millets, seeds production are the major sectors in focus in this current edition of the road map



said Bihar had witnessed less rains in recent years, highlighting that water conservation is necessary in the state to maintain its identity as a water-rich state having rivers and ponds.

She also talked as how climate resilient agriculture could help to combat climate change and stressed that changes in farming pattern could promote biodiversity, reduce exploitation of water resources, conserve soil fertility and deliver balanced food in the plates of people.

The President stressed that she herself belongs to family of farmers and intends to take up farming after her retirement and described herself as a "Bihari" for being aware of the state's rich cultural tradition for long.

"I have been Governor of Jharkhand for six years and my home state Odisha has been associated with Bihar historically. I have seen and experienced Bihar's culture closely. This is why, I feel, I can call myself a Bihari. I will surely visit Bihar more regularly," she said.

Murmu, talking about the significance of agricultural road map, said Bihar's contribution is important in fulfilling the dream of developed India. " Bihar

will have to set up a road map for the progress of the state and agricultural road map is part of it," she said, adding that it would make her happier when Bihar is seen continuously moving on the path of progress by making a road map on every parametre of development.

Chief minister Nitish Kumar, in his speech, thanked the President for inaugurating the fourth agricultural roadmap and highlighted how the three earlier road maps had its impact in quantitatively increasing the production of paddy, maize, wheat and potatoes.

He also talked at length about how the first road map launched in 2008 successfully progressed by the launch of second and third road maps in 2012 and 2017, giving a boost to production of fish, vegetables and lotus seeds.

"In the formulation of fourth agricultural road map, we have taken the feedback from farmers and also putting stress on care and treatment of cattle. We are going to open veterinary hospitals in each 8-10 panchayats," Kumar said.

Source : <https://www.hindustantimes.com/>

Wheat procurement and sale touches new low in MP

The data showed that as compared to last year, the sale of wheat in 175-grain markets in MP in 2024 was five lakh tonnes less

Madhya Pradesh saw a 33% dip in the procurement of wheat in 2024 as compared to 2023, the highest for any state in the country, according to government data. There was also a 10% decline in the sale of wheat in 175 open markets in the state.

MP is the only state in the country where procurement decreased from 7.1 million tonnes (MT) in 2023 to 4.8 MT in 2024, even as the production fell from 22.41 MT in 2023 to 21.21 MT in 2024, according to initial data provided by the state agricultural department.

The data showed that as compared to last year, the sale of wheat in 175-grain markets in MP in 2024 was five lakh tonnes less. In 2023, from March till June 30, 6.4 MT of wheat had been sold, while this year, it was 5.9 MT, the data provided by the Mandi Board, which manages all grain markets in the state, showed.



The farmers are getting Rs.2,800 to Rs.3,100 per quintal for the best quality wheat – Sharbati and Lokman – while the state government was also giving them a bonus of Rs.125 per quintal on MSP of Rs.2,275 per quintal, according to government data. But, the farmers are expecting further increases in price.

Speaking to the media, Paramjeet Singh, a farm activist, said the reason behind the decline in the sale of wheat is because of its high price in the private market, which is due to the ongoing Ukraine-Russia war.

The fall in production is another reason behind the decline in sales.

Moreover, the entire country, including Madhya Pradesh, saw the hottest February

and March, which is the ripening season of wheat, and untimely rainfall and hailstorms, affecting the production and quality, Singh said.

“The farmers didn’t come to procurement centres and markets because of the high price of wheat...Though there was a decline in production, especially in the Malwa region, it was not more than 5%,” said M Silvendran, secretary, MP farm welfare and agriculture department.

Experts estimate that more than 50% of the wheat in the state has either been hoarded by farmers or sold directly to businessmen.

“Marginal and small farmers can’t afford to hoard the wheat for a long time as they need money to fulfil their needs. Last year too the price was high, but more than 65% of wheat was sold to Mandis and at procurement centres till the first week of July, but this time, only 40% of wheat has been sold, which clearly shows a high dip in production due to poor weather,” said GS Chundawat, an agricultural expert.

According to the State Level Bankers’ Committee, medium and large farmers in the state are just 30%, while 70% of farmers are marginal, small and semi-medium.

By Shruti Tomar

Source : <https://www.hindustantimes.com>

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UP Government to launch plantation drive to boost farmer's income

The Uttar Pradesh government has launched an initiative to boost the income of the state's farmers by encouraging them to participate in the plantation drive and earn carbon credits. The Yogi Adityanath government will launch a massive plantation drive in the state on 20 July 2024, with a target of planting 36.50 crore saplings.

Aim of the Uttar Pradesh Plantation Drive

The aim of the massive plantation drive is threefold:

- First, the massive afforestation drive will increase the forest cover in the state.
- Second, it will also help achieve the government of India's goal of achieving net zero carbon status by 2070.
- Selling carbon credits will also become an additional source of income for farmers participating in the afforestation drive.

How will the farmers benefit, and what is carbon credit?

Carbon credits were introduced under the Clean Development Mechanism of the Kyoto Protocol in 1997. This mechanism allows a country committed to reducing carbon dioxide

or greenhouse gas emissions to invest in carbon-reducing projects in developing countries.

Any organisation or company can undertake carbon emission reduction projects like planting trees. Trees absorb carbon dioxide from the environment and release oxygen, so the more trees planted, the greater the reduction in carbon dioxide emissions in the environment.

The reduced carbon emission can be calculated using a defined formula.

The farmer can monetise the reduction in carbon emissions due to his tree plantation. This is called a carbon credit. The farmers can sell the carbon credit to other industries that produce carbon. The industry will buy the carbon credit from the farmer, pay him money, and adjust the amount of carbon they produce with the bought carbon credits.

The one carbon credit is equivalent to one tonne of carbon dioxide or its equivalent greenhouse gasses.

Payment for Carbon Credit

Under the Uttar Pradesh scheme, farmers will be encouraged to plant fast-growing trees like Melia, Dubia, Poplar, and Semal. The state government will purchase carbon credits from the farmers every five years at a rate of six US dollars per carbon credit.

Scheme to be implemented in Three Phases

The scheme for the farmers will be implemented in three phases.

- In the first phase six districts, Gorakhpur, Lucknow, Bareilly, Meerut, Moradabad, and Saharanpur, have been chosen.
- Devipatan, Ayodhya, Jhansi, Mirzapur, Kanpur, Varanasi, and Aligarh have been selected for the second phase.
- In the third phase, the entire state is proposed to be covered under the scheme.

The scheme is expected to benefit around 25,140 farmers, and the total payment for the carbon credits is expected to be around Rs 202 crore.

The Energy and Resources Institute (TERI) and VNV Advisory Services are helping the Uttar Pradesh government with this process.

Source : <https://utkarsh.com>



Budget 2024-25: Agri sector sees 4.5% growth in allocation; boost to pulses, oilseeds but other schemes overlooked

Allocation to the agriculture sector in the Union Budget 2024-25 increased by 4.58 per cent – Rs 1,32,469.86 crore from Rs 1,26,665.56 crore in the Revised Estimates (RE) of 2023-24. Out of total allocation, Rs 1,22,528.77 crore was for the Department of Agriculture and Farmers Welfare and Rs 9,941.09 crore to the Department of Agricultural Research and Education. The allied sectors of fisheries and animal husbandry saw a total allocation of Rs 7,137.68 crore, a jump of 27 per cent compared to 2023-24 RE. While the Department of Animal Husbandry and Dairying saw an allocation of Rs 4,521.24 crore (increase of 15 per cent), the Department of Fisheries was allocated Rs 2,616.44 crore (increase of 53.8 per cent).

Combined, agriculture and allied sectors saw an allocation of Rs 1,39,607.54 crore. In her speech, Finance Minister Nirmala Sitharaman mentioned that a provision of Rs 1.52 lakh crore for agriculture and allied sector has been made. The sector allocation means provision to schemes in different ministries, apart from the above mentioned ones. Meanwhile, the share allocated to the agriculture ministry in the overall budget (Rs 48,20,512.08 crore) was just 2.74 per cent, almost at par with 2023-24. In 2022-23 budget, this share was 3.36 per cent.

In terms of scheme-wise distribution, first let's hear the good news:

Major boost to pulses / oilseeds procurement : In absolute figures, the sector saw an increase of Rs 5,804.3 crore, and 73 per cent of that increase has gone to one scheme: Pradhan Mantri Annadata Aay Sanrakshan Yojna (PM-AASHA). This is likely to give a fillip to procurement of pulses and oilseeds from farmers at fixed floor prices. The scheme got an outlay of Rs 6,437.50 crore, an increase of Rs 4,237.50 crore compared to 2023-24. Pulses and oilseeds also found a mention in the finance minister's speech, in which she pointed out that for achieving self-sufficiency in pulses and oilseeds, the government will strengthen their production, storage and marketing.

"It's a positive move, especially for semi-arid states like Rajasthan, Maharashtra, Telangana and Madhya Pradesh, which majority of the pulses growing happens but face a dearth of marketing infrastructure, with may be the exception of Madhya Pradesh," said Gurpreet Singh, associate professor, Jindal School of Government and Public Policy, OP Jindal Global University. Singh was formerly with the Centre for Budget and Governance Accountability.

India currently imports about 15 per cent of its pulses consumption and about 56 per cent of its total annual edible oil consumption. The increased allocation to PM-AASHA

Combined, agriculture and allied sectors saw an allocation of Rs 1,39,607.54 crore

can boost pulses and oilseeds sowing if it gets effectively translated to assured procurement from farmers, who need cash in hand after harvesting to meet the cultivation costs like labour payment and repaying of loans, and also to invest in the next sowing cycle. "So for that we need a sound marketing infrastructure like in Punjab and Haryana where farmers don't have doubts about whether their crop will be sold or not," said Singh.

Digital crop survey : Sitharaman also announced a digital crop survey for Kharif season using the Digital Public Infrastructure for Agriculture (DPI) in 400 districts. This is a welcome step, given the error-ridden tracking and estimation of yield and production of key crops.

Allocation to other major schemes : While PM-AASHA saw a major boost, another important scheme — Market Intervention Scheme and Price Support Scheme (MIS-PSS) — has not seen any allocation this year. While PSS is for procurement of notified pulses, oilseeds and copra at MSP and it is understood that this would be subsumed under PM-AASHA, but MIS is implemented for procurement of perishable agricultural / horticultural crops for which MSP is not announced.

"While farmers across the country have been asking for a legally-guaranteed price support, with cost component C2 taken as the base for at least 50 per cent more over and above it guaranteed as MSP both in announcement and accrual to the farmer, nothing has been provided for this by the government," said a statement by ASHA (Alliance for Sustainable & Holistic Agriculture) Kisan Swaraj.

Even last year, MIS-PSS was virtually ignored as its allocation reduced from Rs 1,500 crore to Rs 1 lakh, almost a 100 per cent cut. Meanwhile, the allocation to Pradhan Mantri Kisan Samman Nidhi (PM-KISAN), a cash incentive scheme for landholder farmers, remained unchanged, at Rs 60,000 crore. Allocation to 'Formation and Promotion of 10,000 Farmer Producer Organizations (FPOs)' scheme was Rs 581.67 crore, an increase from Rs 450 crore (RE 2023-24).

In the budget speech, Sitharaman mentioned that 10 million farmers in the next two years will be initiated into natural farming, supported by certification and branding. But the 2023-24 budget speech also had a similar commitment.

Read full @ <https://bit.ly/3YhwoD5>

Source : <https://www.downtoearth.org>

Chhattisgarh Poultry Farming Promotion Scheme' Started

Why In News?

According to the information given by Chhattisgarh Public Relations Department on October 7, 2023, 'Chhattisgarh Poultry Farming Promotion Scheme' has been started to encourage poultry farming in the state of Chhattisgarh.

Key Points:

- Chhattisgarh State Livestock Development Department has given advance approval from the contingency fund of Rs 1 crore in compliance with the announcement made by Chief Minister Bhupesh Baghel on August 15, 2023 to start this new scheme.



- Under the scheme, entrepreneurs starting poultry farming will be provided a permanent capital investment grant for 5 years, if they establish a business unit through self-financing or bank loan.

- In this scheme, which was started to provide new opportunities for employment and

self-employment in the state, 25 to 40 percent capital investment grant will be given for the establishment of poultry farming units in developed and developing development blocks.

- For establishment of broiler, native poultry and colored poultry units, 25 percent grant will be given to general category beneficiaries in 'uncategorized' areas and 30 percent grant on permanent capital investment to Scheduled Caste, Scheduled Tribe and EWS beneficiaries.
- Similarly, 35 percent subsidy will be given to the general beneficiaries of 'B' category area and 40 percent grant will be given to the beneficiaries of Scheduled Caste, Scheduled Tribe and EWS on permanent capital investment.
- For poultry layer and parent poultry units, 25 percent subsidy will be given to general category beneficiaries in 'uncategorized' areas and 30 percent subsidy will be given on permanent capital investment to Scheduled Caste, Scheduled Tribe and EWS beneficiaries.
- Similarly, 35 percent subsidy will be given to the general beneficiaries of 'B' category area and 40 percent grant will be given to the beneficiaries of Scheduled Caste, Scheduled Tribe and EWS on permanent capital investment.

Source : <https://www.drishtias.com>

West Bengal govt allocates Rs 293 crore to farmers affected by adverse weather conditions

Bengal govt has released Rs 293 crore to 2.1 lakh farmers who have faced losses due to sporadic rain, Cyclone Remal and a heatwave across the state during the April-May Rabi season, CM Mamata Banerjee said.

In a post on X, Banerjee wrote: "I am happy to announce that (apart from providing Rs. 2,900 cr assistance to 1 crore 5 lakh farmers and bargadars across the state under the Krishak Bandhu Natun Scheme), we are also releasing today onwards a sum of Rs 293 crore directly to the bank accounts of our 2.10 lakh farmers who suffered crop losses due to adverse weather conditions during current Rabi season. This is done under our unique Bangla Shasya Bima (BSB) which is our unique crop insurance scheme where the State Government pays the entire premium for all crops." The CM added that since 2019, state govt has given Rs 3,133 crore to 1 crore affected farmers.

BSB is a state-funded crop insurance scheme under which Bengal provides financial assistance to farmers whose crops have been hit by adverse weather conditions. Farmers do not have to pay any premium for the scheme. The only exceptions are potato and sugarcane crops for which tillers have to pay a maximum premium of 4.85 % of the sum insured.

Source : <https://timesofindia.indiatimes.com>

How Assam's fallow season can be transformed into a season of productivity

Agriculture in Assam is characterized by low productivity because of frequent floods, drought, lack of irrigation facilities during the dry season, use of low-quality seed, limited agricultural mechanization, and the knowledge gap among stakeholders. However, it is possible to achieve double or triple cropping in the state with meticulous planning and the development and promotion of appropriate and farmer-friendly interventions for the rice-fallow areas. Utilizing the rice-fallow areas efficiently could accelerate the growth of agricultural production, generate additional income, and improve the livelihood security of small and marginal farmers.

Agriculture in Assam is characterized by low productivity because of frequent floods, drought, lack of irrigation facilities during the dry season, use of low-quality seed, limited agricultural mechanization, and the knowledge gap among stakeholders.

Source : <https://www.cgiar.org>

Uttarakhand Farmer is Revolutionizing Agriculture with the Development of Narendra 09 Wheat Variety



Meet Narendra Singh Mehra, an organic farmer who distinguished himself by forging a new path in agriculture. His new variety of wheat is an absolute game-changer!

Narendra 09, registered under his name with the Protection of Plant Varieties and Farmers' Rights Authority.

The Birth of 'Narendra 09' Wheat Variety

In 2008, with tomato farming booming in Nainital, many farmers diverted their attention from grains,

resulting in a decline in wheat and rice cultivation. Sensing this imbalance, Mehra set his sights on reviving wheat farming. He discovered a late wheat variety called RR 21 and noticed a distinct plant in his field. With a keen eye for potential, he carefully harvested and nurtured its growth, multiplying its quantity to about 80 kilograms. This unique crop piqued the interest of neighbouring farmers, who began testing it in their fields. After 12 years of persistence, the variety gained attention from the media, scientists, and agricultural officials. "Dr. Vijay Kumar Dohare, the head of PPV&FRA, helped me get this seed registered under my name as Narendra 09," he says. From 2009 to 2021, he distributed samples across Uttarakhand and neighboring states, receiving positive reviews. Today, Narendra 09 is in high demand nationwide.

Unique Traits of 'Narendra 09' Wheat Varieties

Mehra highlighted the advantages of the 'Narendra 09' wheat variety: it requires about 35 kilos of seeds for planting compared to 40 kilos for other varieties. Its sturdy stalks withstand strong winds and rain without falling. Moreover, each spike produces 70-80 high-quality grains, surpassing other varieties which yield 50-55 grains per spike.

Other Considerable Works

Mehra has also introduced sugarcane cultivation to the mountains, enabling farmers to produce and sell natural jaggery at good prices. He introduced black rice from northeastern states to Uttarakhand. He also achieved a world record with 25 kilograms of turmeric from a single plant. His shift from chemical to organic farming highlights his innovative contributions to sustainable agriculture, setting a new standard nationwide and enriching his community.

By Shreetu Singh

Source : <https://krishijagran.com>

Narendra Singh Mehra's agricultural journey began in the village of Devla Malla in Nainital, Uttarakhand. Krishi Jagran has acknowledged his 12 years of experience and innovation in organic farming by honoring him as a State Millionaire Organic Farmer of India. He has pioneered a unique wheat variety named Narendra 09. His journey has inspired countless fellow farmers to embrace innovative and profitable organic practices.

Mehra holds a postgraduate degree in Arts (MA) and a diploma in tourism studies. However, due to his interest in agriculture, he shifted his career. Currently, he owns a 3-hectare of farmland on which he cultivates wheat, rice, and sugarcane, relying on traditional seeds, including old and indigenous varieties, and earns about 12 to 14 lakh rupees annually.

Transition to Organic Farming

Mehra remembers the early days when he used to apply chemical crop protectants and fertilizers on his fields. His expenses exceeded his income, making it challenging to manage the farm and support his family. "The circumstances pushed me to find other methods where I could secure a stable income for my family," he shares. "That's when I discovered organic farming, which lowered my input costs, replenished soil health, and improved my earnings." Since transitioning to organic farming, his expenses have been reduced by almost 90 percent.

Currently, he neither uses chemical fertilizers nor pesticides in his fields. Instead, he prepares pest control solutions at home, such as neem leaf extract, cow dung, and cow urine. Additionally, he collects traditional seeds and works on their conservation and enhancement. By using these innovative methods, Mehra has made his venture extremely profitable. He has also developed an improved wheat variety named

Online Meetings



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Recently Completed Meetings

Mr. Ashish Kumar on "Satellite based crop health monitoring system"

Mr. Ashish Kumar is Senior product manager at Farmonaut technologies Pvt. Ltd. Bangalore, Karnataka

Dr. Deborshi De on "Low External Input and Sustainable Agriculture (LEISA) in Tea"

Dr. Deborshi De is the CEO of Smart Management Consultancy (SMC) NLRP- FoStAc, FSSAI, Kolkata, West Bengal

Ms. Sailaja V. on "Value addition in bee farming"

Ms. Sailaja V holds the position of Assistant Professor at Forest College and Research Institute in Hyderabad, Telangana.

Mr. Ambaprasad Nerlikar on "How to set-up a profitable mixed organic farming"

Mr. Ambaprasad Nerlikar is the Proprietor of Venugram Organic Fresh Mangalwarpeth in Belgaum, Karnataka.

Mr. Nagarajan Padmanabhan on "Procuring, processing, and exporting of cashew nuts"

Mr. Nagarajan Padmanabhan is the Managing Director of Marlynut Cashew Industries in Bengaluru, Karnataka.

Mr. S. Gowri Shankar on "What is the role of information and communication technology ICT in agriculture?"

Mr. S. Gowri Shankar is a Research Scholar at Annamalai University, Faculty of Agriculture – Department of Agricultural Extension Annamalai Nagar, Chidambaram, Tamil Nadu.

Dr. L. V. Ravishankar on "Hydroponic cultivation"

Dr. L. V. Ravishankar is the Production and Plantation Manager at Red Otter Farms in Nellore, Andhra Pradesh.

Mr. Dhanraj Deshpande, on "Strategies for achieving success in organic jowar farming"

Mr. Dhanraj Deshpande is a Farmer and Co-Founder of Deshpande Organic Farm in Fakrabad, Ahmednagar, Maharashtra. To know more view <https://www.linkedin.com/in/dhanraj-deshpande-89292b46>

Mr. Anjil Anvin Jain on "How to cut or reduce farming expenses through agro machineries"

Mr. Anjil Anvin Jain is the Founder of Vinglob Greentech (I) Private Limited in Ahmedabad, Gujarat.

Mr. Devendra Pal Singh on "Women's role in promoting organic agriculture: Challenges and opportunities"

Mr. Devendra Pal Singh is a Freelancer Consultant and Principal Advisor (Agriculture and Agribusiness) from Greater Noida, Uttar Pradesh. To know more view <http://linkedin.com/in/DP-Singh-Agri-Consultant>

Ms. Laxmi on "Thermosonication – Its influence on various quality properties in fruit juices"

Ms. Laxmi is a PhD Scholar from Kerala Agriculture University in Kerala. To know more <https://www.linkedin.com/in/laxmi-shindhe-b9435821a/>

Mr. Ashok Tanneeru on "Smart farming with carbon sequestration(removal)"

Mr. Ashok Tanneeru is the Founder of Tanneeru Croppinn Pvt. Ltd., in Kondapur, Telangana. To know more view <https://www.linkedin.com/in/ashok-tanneeru/?originalSubdomain=in>

Mr. S. Ramakrishnan on "Orchid mokkara cut flower production and scope"

Mr. S. Ramakrishnan is the proprietor of Rynco Orchids in Trivandrum, Kerala and he is also the Proprietor of M/s. Cryptox BioSolutions, Kanyakumari District, Tamilnadu.

His interests are orchid farming, organic farming and pest control using predator & parasitoides. Rynco Orchids is the largest pot plants orchid farm in South India. To know more view <https://www.ryncoorchids.com/aboutus>



Mr. Vishwanath Nandagudi on “Software automation for hybrid seed companies”

Mr. Vishwanath Nandagudi is the Co-Founder of Arnetta Technologies India Pvt.Ltd. in Bengaluru, Karnataka.

Ms. Anushree Y K on “How to setup a profitable dairy unit with 10 cows”

Ms. Anushree Y K is Assistant Professor at Dairy Science College in Hebbal, Bengaluru..

Dr. V K Jayaraghavendra Rao on “Sustainable rural livelihoods and migration”

Dr. V K Jayaraghavendra Rao is the Principal Scientist ICAR-IIHR(Indian Institute of Horticultural Research) in Bengaluru, Karnataka.

Mr. Sadananda K on “Mushroom Cultivation – Button, Oyster and Milky Mushroom”

Mr. Sadananda K, Founder of Disha E-Farm has been into mushroom cultivation for the past 7 years. He also conducts practice training for mushroom cultivation. To know more view <https://bit.ly/2WVh90K>

Dr Barathi Nambi on “Commercial production of bamboo in India”

Dr. Barathi Nambi an Agricultural Scientist , Growmore Biotech Ltd. has done his doctorate in agriculture and has hands on experience in plant tissue culture and cultivation of 85 different species. He has been specialising in bamboo for the past 15 years for large scale cultivation, conversion of bamboo into different type of energy products such as Electricity, Bio-CNG, Charcoal, Bio-Ethanol, Bio-Petrol/Diesel. He says his area of interest in agriculture is Bamboo cultivation, Production of Electricity from Bamboo, Production of Bio-CNG from Bamboo, Production of Bio-Ethanol from Bamboo and Production of Bio-Petrol/Diesel from Bamboo. To know more view <https://bit.ly/3druuFO>

Mr. Ramchandra Appari on “Tree Transplantation – How I have translocated more than 15,000 trees?”

Mr. Ramchandra Appari, Founder of Green Morning Horticulture Services Pvt. Ltd., has done Masters in both Entomology and Agri-Business Management. He has exemplified the unification of innovative ideas in the traditional method of landscaping with an objective to bring modern agriculture into the corporate sector and earning millions by paving the transformation in traditional landscaping. Green Morning Firm is continuously providing consultancy to farming communities through Haritha Nursery. The Nursery’s priority has been to grow indigenous, tropical, ornamental fruit trees, shrubs and climbers to replace the large numbers chopped down in Hyderabad City and surrounding areas. Mr. Ramachandra Appari says they have more than 10 years experience and have translocated more than 15,000 trees. To know more view <https://bit.ly/2zwzlgv>

Mr. Nitin Goudar on “Sandalwood cultivation”

Mr. Nitin Goudar , Sandalwood Plantation Consultant and Founder & CEO, Darvi Group has done B.Sc. (Forestry). They have been into developing agroforestry plots across South India, future agriculture scope and shift in conventional agriculture. His area of interest in agriculture is agroforestry and organic farming. To know more view <https://bit.ly/379JMwt> , <https://bit.ly/2YaKmWP>

Mr. Parthasaradhi Nara on “Organic, natural farming & marketing organic produce”

Mr. Parthasaradhi Nara, Founder of Organic Anantha Products LLP is born and brought up in agriculture family. He has done M.Sc (Computer Science) and worked in IT sector for 11 years. He says because of his family background and issues in farming , he choose agriculture. His area of interest in agriculture is Organic Farming , Natural Farming and Sustainable Agriculture methods. To know more view <https://bit.ly/3ccKpHo>

Dr. M. Vishwanath on “Cultivating flowers for domestic and export markets”

Dr M. Vishwanath is the Joint Director of Horticulture, Bangalore Division and Managing Director of International Flower Auction Ltd., Bangalore. This will be an online discussion about the potential of both export and domestic flower market. To know more view <https://bit.ly/3creTV9>

Mr. Parashuram Patil on ‘Advance Production Practices in Turmeric Cultivation’

Mr. Parashuram Patil, Scientist – Horticulture in ICAR-BIRDS KRISHI VIGYAN KENDRA, Belagavi has done M.Sc. Horticulture (Fruit Science) with NET qualified. His area of interest in agriculture is Horticulture (Fruit Science, Vegetable Science, Floriculture, Plantation, Spice, Medicinal, Aromatics and Post harvest handling of horticulture produce) organic farming issues.

Mr. Satyanarayana Choppavarapu on “ All about Melia Dubia tree cultivation ”

Mr. Satyanarayana Choppavarapu , Managing Director of SANF Greenmens Pvt.Ltd. has 7 years practical experience in Melia dubia cultivation and integrated farming system. They are into supplying plants and also provide consultancy for melia dubia, sandalwood and bamboo plantation. To know more view <https://bit.ly/2ySBr3F>

Mr. Siddaraju K.A. on ‘Innovative Marketing – Directly connect Farmers and Consumers’

Mr. Siddaraju K.A. is the Chief Executive Officer Anekal Horticulture Producers Co.Ltd. says his organisation, comprising growers of a variety of vegetables including English cucumber is now selling its produce directly to consumers on streets of various localities in JP Nagar. They focus on localities as there are no restrictions. His organisation too is planning to further build on their direct marketing concept post lock down. He is into forming FIGs (Farmer Interest Group) and Developing a Company, finding new area of business development of FPO . Refer the article link <https://bit.ly/2XBDQbg>

Mr. Rishi Ram Prashar on ‘ Apiculture – Opportunities and Challenges ’

Mr. Rishi Ram Prashar, Founder of Parashar Bee Farm is a Bee keeper and an Agriculture graduate, from Barna District, Kurukshehra, Haryana. He has about 14 years practical working experience in beekeeping, honey production, bee pollen, propolis and marketing. He is also conducting training on Apiary and educating fellow farmers to start Bee keeping venture. Mr. Prashar says, “Bee keeping is mainly based on natural elements such as flowers, climate and Bees per unit area”.

Online meetings are available only for Premium Members



Talking to

Mr Abhirup Sikdar

Project Specialist, Malancha, Kolkata, West Bengal

Discusses about environmental containment technologies: landfill and soil capping.



We have seen in our daily routine people throwing garbage outside. This is collected and thrown in to landfill sites and open areas which are not nurtured or taken proper care of. It leads to degradation of surroundings, water, soil, and air over the years. We must ensure that the landfills are taken care of with the help of good liners so that it does not spoil the surrounding areas, no contamination, and affecting the ground water. MSW is a major component of land fill, and there is a high possibility of methane production in these landfill areas which often leads to fire in the landfill areas which is again detrimental to the surroundings. So, governments and other departments have laid down certain guidelines on how to make the landfills.

Nowadays, we create an area which is

very deep from the existing layout, put geo liners or poly sheets so that the dumped material does not contaminate the soil. It has many benefits as we put gas pipes to collect methane and other gases which go directly into methane gas chamber or aeration chamber where it is further segregated and used for biofuel usage. When rain or other water comes into MSW dump, they react with the existing materials and start collecting at the base level. So, we also plant and set up pumping stations which collect the entire leachate water which is processed and released.

Since MSW or landfill consists of household things also, there are many biodegradable materials in the dump yards. So soil capping is a technique to cover the entire dump by greenery. It is of two types – geosynthetic based caps and vegetative caps. The synthetic capping was done in Jamshedpur. We cleaned the entire area covering the

soil with sand to make the base layer so that the rainwater or other waste water does not percolate deep in the existing MSW which has been there since many years. Then plantation is done. The water running down the slopes is collected into chambers and filtered and released into the ground. There are certain standards to be followed when applying bio capping or soil capping projects, regularly checked, or do a daily monitoring.

Geosynthetic capping liners are put over the pit and covered fully. Soil is spread and grass grown. In many MSW pits, removing the entire dump is very difficult. Biomining is a part, and bioremediation is part of this process. To ensure landfill gas management, pipes are installed to collect the methane and other gases. Leachate treatment to monitor ground water is part of the entire project. If the parameters are not met, the ground water quality will deplete over the time. Soil remedial technique, capping, and phytoremediation are the other techniques used. bioremediation is bio mining popular in India but has some limitations. We have to segregate dry and wet waste as otherwise the machines cannot function properly. We need to educate people about the methodology and the benefits of the technique. The regulatory framework is done by Central Pollution Control Board and other regulatory bodies by following certain norms. Regular compliance is needed in all these projects.

The main challenge in these kinds of projects is funding as bio capping or bioremediation is a huge fund based activity. There is inadequate infrastructure in our country, by people are working towards that, with government initiatives. Many people are not compliant with these kinds of work as they do not have enough knowledge and fail to understand how harmful it is to them. We have to educate them to achieve success. The future of environmental containment technologies lies in our hands as we keep working, and a lot of researches are going on. The landfills are used for decomposing and generate electricity. The rainwater harvesting systems are

installed in landfills.

How did you get interest in this particular project?

I was part of a horticulture company, our family business, and we got the clue from one of our clients to bring in this new technology to develop a certain area. We often find that people do not segregate the waste. When we start segregating the garbage, the government or civic bodies working on a daily basis to mitigate the landfill problems and containment, it will become easy for them. So this thought process brought me to this idea of landfill and containment technologies. Since a long time we are working on this project.

Segregation is there since a few years, but people are not serious about it. When we see the municipal dumping yard, we see dry waste, mechanical waste, electronics waste, and even wet waste. But many cities like Jamshedpur have made people aware of the problems, but many cities are not aware of why such segregation is needed. We have to approach every strata of society to solve the problem.

What are the key components of modern landfill containment system, and how have they evolved over time?

The key components are capping, bioremediation, and phytoremediation. Earlier we had no proper methodology for segregation. Many landfills did not have geo liners below them. But now the landfill is not spreading any smell or any harm, but the water level has depleted and contaminated. We can see how people living in surrounding areas are affected with illness. They do

not have proper flora or fauna in the surrounding areas. In one of the areas which was barren earlier, we have found 30 species of fauna. So capping is a major technique to solve the problems of landfill. Biomining and bioremediation are techniques which involve segregation of wet and dry waste. The dry waste goes into the machine to get fully segregated. The wet waste is decomposed, and leachate is processed for ground water recharge. The decomposed material is converted into fertiliser to help the farms nearby. The rest of the materials go to the landfill. Phytoremediation involves planting more trees to help in mitigating or breaking down the complex materials in the MSW dump. In Jamshedpur, the land was covered to save the surface from water contamination. So phytoremediation is the concept being worked on by people. USA has done a good job in this regard and converted 200 hectares of land into safe zone.

What is the difference between landfill liner and landfill cap, and why are both essential for landfill management?

Landfill liners have two types – geosynthetic used when developing a landfill site where MSW dump or segregated waste is dumped to prevent mixing with the ground water and contaminate it. The pit-based one is placed on the ground, and the one for



capping the entire project. The top liners are synthetic based and biodegradable. We use mat liners or jute mat liners or synthetic liners. Top layered liners depend on the nature of landfill. The duration, key components, and nutrient values suggest which liner should be used on the top.

What are the environmental risks associated with improperly designed or managed landfills, and how do containment techniques mitigate the risks?

If there is a river adjacent to the improperly maintained landfill, and if we do not use landfill technologies, there will be plastic accumulation in the river, and the entire surface water from the dump yard will also go into the rivers. When it is unattended, with no proper design or area demarcated, with garbage being dumped constantly, it will contaminate the whole area. We have often found syringes or other household items in the landfill. So this creates an environmental hazard for people living nearby due to air pollution, water and soil pollution.

What role does soil capping play in the closure and post-closure management of landfills, and what are the benefits?

When we do a capping project, we cannot just put a liner over there and leave it as over the time, it will get damaged. There is a risk of wear and tear for the liners. So by following an aesthetic method, we can grow trees





Talking to

and see greenery. Scientifically it creates a layer which helps in mitigating the surface runoff of soil and pollutants and improves the biological index of the area. Then it improves fauna and microbes, and it will be biologically diversified and beneficial. Just within a year, we have converted the area into a beautiful park.

How do engineers and scientists determine appropriate type of liner material to use in landfill, and what factors influence their decision?

Certain parameters have to be fulfilled to determine the kind of liners or techniques to be used. It is not just the liners that are to be determined, but it is the technology that needs to be used. This happens due to the nature of landfill and reuse of land, and availability of funds because each such project is cost effective.

What are the challenges associated with long term monitoring and maintenance of landfill containment system, and how can they be addressed?

From the moment the project starts, parameters like ground water quality, nearby area soil quality, and nutrients should be considered. The ambience



and air quality must be monitored. Once the project is completed with the techniques, daily monitoring must be done. Nowadays ground water quality management systems are available as also for air. Soil testing can be done at regular intervals as suggested. We should ensure no adverse effects are noticed in that area. There should be proper communication.

Are there any innovative or emerging technologies for landfill containment that have potential to improve environmental performance and safety?

Phytoremediation and bioremediation are the modern techniques and innovative ones. Scientists & researchers are working on it as bioremediation needs segregation. Phytoremediation involves planting more trees and specific varieties of plants and shrubs. It involves small microbes and organisms.

How does climate change impact the design and maintenance of landfill containment systems in regions prone to extreme weather events?

People in hilly areas dump garbage on hill slopes. This can cause landslides. Areas which are adversely affected by climate change, there are techniques or methods, we must use better liners and capping to withstand the weather changes. Liners are often GSM based, and changes happen during every project.


Can you provide examples of successful landfill containment projects and the positive environmental outcomes?

We are working with Jamshedpur Tata Steel and developed the entire area in the last 4 years with 30 fauna species. The biodiversity of the area has increased with better air quality. Capping and protecting the 82 thousand sq. m area has increased the living standards of people there. Rainwater harvesting systems collect the surface water and send to collection pit. Dalma View Point, Nature Trail , Bara Old Dump Capping are some of the successful projects in Jamshedpur.

Are you working with state governments? Is yours a private company?

Yes, with both states and central governments we work. Our name of the company is Malancha, founded by my mother who is interested in horticulture, and has studied in this field. We have learnt to understand trees, nature, and environment from her. Horticulture is a huge field now and new subject. We learn to avoid any improper planting. We are working all over India & Abroad, and completed various projects for Government, P.S.U & private companies over the last 20 years. We specialize in Landscaping, Horticulture, Industrial Landscaping, Design & Planning, Specialized projects like the topic discussed above, and Turnkey projects.

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Prof. (Dr.) P. L. Saroj

Principal Scientist and Head, Division of Crop Production, ICAR- Central Institute for Subtropical Horticulture, Lucknow, UP, & Former Director, Directorate of Cashew Research, Puttur, Karnataka

Enlightens on the 'Latest Trend in Cashew Research in India'.



The cashew, an exotic wonderful crop, is often grown on poorest land and eaten by the richest people in the country. Cashew kernel is very delicious crispy and milky taste. It is grown all along the coastal areas of the country and was introduced in India by the 16th century as a forest crop for soil conservation in the coastal belt. So the plantation was not planned properly.

Later on, people realised that it is a wonderful crop and has all the nutritional benefits like the other nuts. It has least saturated fatty acid, and so its attributes are similar to other nuts like almond or walnut. It can manage weight loss with the omega fatty acid present in it; prevent cancer with the flavonoids and antioxidants, and other health issues. Later on it was classified as a dry fruit, as an important

horticultural crop. It is grown in more than 65 countries as an important crop.

India is the leader in promoting crop with various government and non-government organisations supporting the cultivation. ICAR-Directorate of Cashew Research was established in Puttur, Dakshin Kannada in Karnataka and Directorate of Cashew and Cocoa Development in Kerala under the Ministry of Agriculture and Farmers' Welfare, Govt. Of India are looking after the research and development of cashew in the country. Government is taking lot of initiatives to promote the crop. In India, it is grown in more than 0.7 million hectare land with production at 0.8 million tons. The productivity per hectare is 762 kg. It earns a huge amount of foreign exchange too. The advantage of this crop is it requires less input for cultivation. Though our country has huge potential to produce

raw cashews, what we are producing is not enough.

Global production of cashew nut is fluctuating. Cote d' Ivoire is the largest producer of raw nut with 20% contribution, followed by India., Cote d' Ivoire, India, and Burundi contribute more than 50% of the total raw cashew nut production, followed by Vietnam, Philippines, Tanzania, Mali, Guinea Bissau, and Brazil. Vietnam is the highest producer of cashew kernel. Besides, its own production, substantial amount of raw nut is being imported by the Vietnam for further processing. India comes second, Cote, d' Ivoire third, and Philippines 4th. India is 4th in productivity though we have better average productivity among the world countries. In India, Maharashtra produces 1378 kg per ha, West Bengal 1140 kg and Gujarat 900 kg. There is plenty of scope in production of cashew in different states, and we need to harness it so that we can produce more as we have the potential.

The concern is productivity and profitability is very low as cashew is grown on rainfed, degraded land under neglected conditions. Poor land is given for cultivation. Cashew is not irrigated but rainfed. We do not use the new varieties, and the old ones are senile. Non- adoption of recommended package of practices is the main reason of poor orchard efficiency. Rejuvenation technology for old orchard is also not adopted. Poor marketing system and lack of growers' organisation like other fruits owing to poor economic realization. To improve these conditions, we have to strategically adopt the innovations, technology, and replace the old plantation.

New plantation with high yielding variety with quality planting material is needed. We have to do them in gradual pace, go for grafts with high yielding variety, remove the old unproductive trees and plant new ones. Limb Pruning Technique has to be followed to improve the profitability and productivity. For replanting program, we have to go for quality planting material, good variety propagated by appropriate technique, and plants as per standard. We have to follow soft wood grafting



technique. Indian scientists are making a good dent in this area. Old orchard rejuvenation is important, and we have to cut the branches in the months of May and June, and in July we have to go for grafting with improved variety. In this operation, there may be problem of stem and root borer which has to be managed with recommended management practices.

We have more than 50 to 60 varieties in India of which 22 are hybrid. Ullal 3, Priyanka, Bhaskara, V 3, V 4, and V 7, Madakathara 3 and BPP 3 are some popular varieties. Some varieties have specific traits like Bhaskara, Indira caju, Priyanka, and Vengurla 8. We have developed H 125, H 126, and H 130 which are jumbo sized varieties, which produces nuts of about 11-12 g. Some of these are very good for high density planting. Each state is recommended to grow specific variety of cashew. If the size is big and productivity is high, the price for the cashew goes up. Some cashew types get pink apple which has colour brown nut. The apple colour is yellow and yellowish pink. There is a purple apple colour cashew also having all leaf, fruit and nut in colour purple. Nethra Ubhay in Karnataka is the first dual purpose variety, of its kind in the world.

Management of plant canopy architecture is not being focused on and generally we forget after planting cashew plants. Therefore, since beginning, proper training of plants is required. There should be branches on all the four sides and follow modified central leader system of training. Regular pruning of dried branches is

needed. We have technology for high density planting. Earlier plantations were established at 7 to 8 metres distance as normal method of planting accommodating 150-200 plants/ha. Now, we accommodate 400-500 plants per hectare which is 4 times more than earlier. With more plants per unit area, productivity is higher. In high density planting, appropriate management skill is required. We have to select the good variety which are prone to pruning and look for the canopy architecture management. In ultra high density planting, 1600 plants can be accommodated in one hectare by planting in 2.5 x 2.5 metre distance. Regular pruning, use of Bordeaux paste, and recommended dose of fertiliser and drip irrigation are to be followed. Karnataka and Maharashtra are following this system for enhancing productivity of cashew nut.

Since cashew is grown on neglected areas having poor fertility status, thus we have to do proper nutrition and water management. We have worked out on how much NPK is required for each plant. We have to apply gradually and after 5th year follow the recommended dose.

While applying, we have to mix at least 15 to 20 kg FYM per plant to improve the soil condition and moisture. When we follow closer planting of cashew, the requirement of nutrients is different. In a 500 plant population, if we give 150 g of Nitrogen, 50 g of Phosphorus, and 50 g Potassium, it gives high yield. Lower amount of fertiliser and higher plant number will give good response. We have optimised the limit

of fertilisers to 150:50:50 of NPK per plant per year which is sufficient. Method of application is also important as deep application is not good. Giving fertiliser beyond major canopy is not correct. Fertilizers have to be given at a radius of 2 m and top 15 cm of soil depth. Foliar spray urea, H₂PO₄ and K₂O₄ gave good response on nut yield. Foliar feeding is important in dryland areas where the soil moisture is less. We can grow plants like Glyricidea and Sesbania for green manuring in cashew plantation. Cashew is a crop that is very much prone for organic management.

Water is the limiting factor in cashew cultivation as most of the cashew plantations are managed as rainfed. To harvest post monsoon rains, we can have modified 3 m crescent bund and 6 meter length 1 metre width and 0.5 m height on the upstream of the plant for maximum yield. We can fill the trenches with biomass to improve productivity. For good yield, cashew should be irrigated regularly, and when we go for drip irrigation and fertigation, we can save fertiliser cost and increase productivity. About 20 litres of water is needed per day per plant. It helps in flowering, fruit setting and nut development. We have to focus on intercropping also to increase the income. We have found that when we grow pineapple as intercrop, we can earn Rs. 1.50 lakh easily, pepper can give Rs. 1.74 lakhs, and they can be intercropped in the cashew orchard to increase productivity and profitability.

Pest and disease management is very important; otherwise there will be heavy yield loss. Tea mosquito bug (TMB) is a serious pest of cashew which can be controlled by spraying Cyhalothrin, Imidachlorpid, Prophenphos, and Triazophos. No pesticide should be continuously sprayed otherwise pest resistance will be developed. We can spray before flowering i.e. flushing and fruit development stage. Bhaskara variety is less affected by TMB. Cashew stem and root borer (CSR) is another important pest causing significant loss of cashew plantations. Regular monitoring is required, we have to remove the borer from affected portion and destroy. Swabbing of the infected portion and drenching the root zone

with Chloropyriphos 0.2% minimizes the problem of CSRB. Anthracnose, dieback, damping off, inflorescence blight etc. are major diseases of cashew should also be taken care of. Weed management is also important in cashew cultivation which can be done either manually or using chemicals.

India is the first country to have commercialised post-harvest processing with lot of automation at different stages of processing, thereby reduces women drudgery which are involved in kernel extraction. Now, many private players are coming in cashew nut processing industry. Besides cashew kernel, several value added products can be made from cashew nut. Not only the nut, but the cashew apple can be used to prepare many products like, RTS, jam, blended syrup etc. Feni is the commercial product of cashew apple and very popular in Goa. With technology, policy issues, crop insurance policy, and organic certification are areas where the government, farmers, and industries have to take initiatives. The import policy has changed a lot in cashew scenario and now more funds are allotted. By 2030, we should be self-sufficient in cashew production using innovative production technologies, automation in cashew nut processing and high price realization using market intelligence.

Are there any innovative practices in cashew farming to address climate challenges in India?

Comparatively cashew is less affected with climatic aberrations than various commercial horticultural crops like mango, guava, grapes, litchi, citrus etc. Cashew is a crop that can face the uncertainty of climatic conditions as it is very hardy to various abiotic stresses. Moreover, moisture stress during flushing, flowering and fruit development stage has resulted poor production. Besides, cyclonic rains during flowering also damage crop to a significant level. Therefore, to mitigate ill impact of climate change not only development of climate resilient varieties are required but also proper moisture management by using suitable land configurations, use of mulching, canopy architecture



management, cover cropping and other agronomic practices are also advocated.

What challenges and opportunities are emerging in the Indian cashew industry, and how is research addressing them?

Though we are producing about 8 million tons of raw cashew nut but some other players in the world are producing more than us. The processing strength of Indian industries are more, hence we are importing raw nut from other countries. So we have to minimize this gap between production and processing requirement. In this direction, there is direct role of government institutions to address the researchable issues. Though, government policies are supporting to Indian industries but concerted efforts are required by cashew growers also by adopting high density orcharding and good horticultural practices to become self-sufficient in cashew nut production. We have to go for newer challenges. Complete automation in processing industry is very much needed. We have to diversify our products and also focus on utilization of cashew apple. We can involve nutritionists, horticulturists, community science personnel and engineers in the process of automation, grading, packaging, product diversification and marketing where government support is also required.

How is sustainable and eco-friendly agriculture being incorporated in cashew farming in India?

With lot of practical issues, sustainability is a concern. Farmers of other crops like banana, grape, or mango follow package of practices to get productivity and profitability

throughout the year. But we do not adopt modern cultivation practices for cashew. We have to educate the farmers on capacity building program, and institutions have to come forward for this with research and technology. Strong linkage among line departments is needed to maintain the productivity and profitability of cashew orchards. There should be minimum use of systematic insecticide and use of biological control practices is suggested so as to produce safe cashew kernel.

Are there any research efforts focused on improving the livelihood of cashew farmers in India?

Many programs are being organised by Directorate of Cashew Research Puttur, Karnataka to address the high productivity of cashew crop. Technology modules were prepared and taught to farmers to make cashew a profitable crop. Government has started giving subsidy to cashew farmers. We are suggesting for new recommended varieties which give higher productivity to increase income. Capacity building program for total package of practices are being worked out and trainings are being imparted to farmers of different states. Cashew should be graded and sorted to bigger nuts and smaller nuts to get better price. Farmers are encouraged to set up their own units, and government is offering subsidy for setting up primary processing units. Several initiatives are being taken to improve the profitability and livelihood security of farmers involved in cashew cultivation.

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Collective Farming

Mr Kandlagunta Srinivasa Rao

MD-Founder, InAcre India LLP,
Hyderabad, Telangana

Talks about collective farming the future of agriculture.



We are facing many challenges in agriculture sector in particular with only 40 crore people out of 130 crores having agricultural land, and the available land proportion in India is less than half acre. In villages we are slowly implementing collective forming model though they have less land sizes. There is no input from outside. Every farmer can make his own manure, seeds, and there is no additional expenditure for cultivation practices. marketing and water system is worked on the collective model. After the Green Revolution era, people started using all inputs from outside, mechanisation, and labour. So monoculture was introduced which has made them depend on marketing system and strategies, government subsidies, and support

for prices. People with agriculture knowledge in villages are aging, and so they are unable to continue the practice. Due to globalisation, changing lifestyles, education, employment, job opportunities, and migration from villages, it is difficult to do agriculture in small scales.

The introduction of chemical fertilisers and insecticide companies, seeds and infrastructure and mechanisation companies has made the farmers the consumers. But the farmers are facing lot of challenges. Another challenge is the contract farming, it is a one individual company or person profit oriented decision.

With collective farming or community farming, which is going to be the future of India, farmers with small landholding come together. With lot of agricultural land being converted

into non-agricultural land, they are forced to leave the village, and it is a big challenge to food security and safety. In India, there is a land selling limitation. So we want to showcase a farming model which have many benefits. We are cultivating more than 1500 acres in Telangana and Andhra Pradesh. there are many benefits like social and environmental benefits apart from benefits to farmers. We identify big bunches of land in a single place, at least 100 acres which is the minimum viable size to do farming, we do scientific research and find water availability and proximity to reach markets. People can joint this group and form a society, where the lands are given as lease to the company for agricultural practices.

We identify good lands, fertile soil, soil conservation, water conservation, and practices like biodiversity with organic agroforestry. We establish the infrastructure which is forever. We do organic farming only, and we prepare the inputs in our place only. We have a goshala in our farm with which we produce Gobar gas, manure, and biodigesters which will be nitrogen phosphorous enriched. We use micro irrigation, and there is no tillage. Though it may be less in quantity, it is a quality product, and we get good price too. We sell the produce directly to members associated with the organisation and outside market. It is a soil to store model, and our practices are environment friendly and farmer friendly. We know a company who translate the ancient agriculture history into English, and we follow them.

After two or three years, we want to adopt some villages and do the collective farming model. In a village with a few thousand inhabitants, we spend about Rs. 7 to 8 crores in buying fertilisers every year. if we produce our own inputs collectively in the village with our own dairy, we can produce manure, biogas, and milk. This will be an integrated and sustainable way of agriculture forever. As of now we do not have even 0.3% of carbon matter in the soil, but we should follow practices to get at least 3%. To drill borewells, in traditional methods, for 100 farmers we may need 100 bores, but in collective



Collective Farming



farming, we can do with 10. This way we can conserve water, share all the infrastructure, expenditure, and share profit. This type of community supported agriculture is the future in India. We have to promote the same. We can grow whatever the village requires first, consume healthy food, and the remaining produce we can sell in kilos or quintals with good packing. In a one-time establishment, we can have biodiversity crops and increase soil health. People need not migrate to urban area, but they can do bio culture, processing of agricultural produce, etc. I am sure farming will be a profitable profession in the coming days with huge hope for rural economy as there is no additional infrastructure required. We hope to establish models from where people can learn about how, what, and where to do agriculture.

How can collective farming models help small scale farmers improve their access to resources and markets?

Small scale farmers means the ones with one acre or less. So they have to form a society. The government is also encouraging FPOs. Based on the land holding capacity they can get the shares. It is a collective harvesting proportionate sharing business. It is mostly useful for small farmers.

How can agriculture students get involved or learn from successful farming initiatives?

They can approach us, come here, and do internship in our company. They can learn how to do and do things correctly. With basic things, we charge for food and accommodation which will be tents or rooms. This will work out to about Rs. 300 per day. One week of training is sufficient. The training

includes soil selection, soil testing, crop planning, dairy establishment, manure preparation, Agri inputs like fertigation, pest management practices, harvesting practices, and marketing techniques. We are located about 50 kms from Hyderabad.

What are the challenges and potential solutions for integrating technology and modern farming practices into collective farming systems?

Definitely we have to integrate modern technologies like micro irrigation, sprinkler system, biodigesters, etc. There are no challenges as such. We have to have a proper farm plan, crop plan, and farm calendar year. Collectively we can sit, write, and based on the input we can proceed. It differs from location to location. We have to design and based on our requirements, we have to plan and arrange for irrigation practices.

What are the key benefits of cooperative farming after reducing input cost and increasing crop yields?

If there are 100 farmers we need 100 borewells, but in integrated collective model, they need only 10 borewells. For farming infrastructure like micro irrigation, central drip irrigation system, they can share land area wise. They can grow produce, take distribution proportionately. They



can have soil to store organisation, and there will be no worry to sell the produce or brand it. Everything is done collectively. They can create a platform to make it a profitable project. It is environmentally friendly, farmer is benefited, and public health is taken care of by offering healthy food.

How can farmers and agriculture startups collaborate to create successful quality farming ventures?

Agriculture startups are very limited. If there is unity among farmers, people who complete graduation, can have their job opportunities in the village itself. We need to have a proper crop plan, and based on our requirement, we have to grow crops, do value addition, and prepare the required inputs. So in a village itself, the youth can have their agriculture entrepreneurship ideas. This will help establish livelihood everywhere. We have to focus on the villages first to live comfortably and a healthy life collectively to enjoy the fruits of the collective farming.

What role can government policies and support have in promoting and sustaining farming collective initiatives?

Government always works on the number. If the public demands, the government has to accept their request. The role of government here is less. But we should not depend on the government support. The government is helping FPOs to get infrastructure. We need authorities and agencies to help us identify the proper ground water, establish proper irrigation system, and establish proper food processing unit. These are the areas the government can help us.

How do collective farming contribute



Collective Farming

to sustainable and environmentally friendly agriculture practices?

Collective farming makes us take care of the ground water harvesting practice. We can harvest through proper trenches and water harvesting practices., soil conservation practices, and follow agroforestry model to increase the soil fertility. It will surely have an advantage in our environment as we use all the local produce manufactured at the village level and is under our control. We can sell through proper value addition and get a good price for our products.

How can collective farming help address food security, food distribution challenges in urban areas?

When we are doing a collective farming, we assure safe and healthy food for the urban areas. They can visit our farm, get assured, arrange for contract with the farmers instead of individuals. We can establish farmer store within the community. It is a win-win situation. We can offer quality produce at a reasonable price. We can offer them a healthy and quality food. It is a good assurance nowadays as healthy and safe food is becoming a challenge.



What are the financial and legal considerations that Agri startups and entrepreneurs should be aware of when engaging in collective farming?

Government is already working on establishing and promoting FPOs. So if we approach any horticulture or agriculture office, they will help us to get connected with FPOs. They will take care of the legal formalities, and they will give some fund also to establish it. So there will be no problems.

How can education and training programs assigned support the skills and knowledge for successful collective farming ventures?

Seeing is believing. So we can always learn by observing only. Instead of viewing videos and attending classes,

we can visit the CSA farm which will teach us all the required proper information.

What are the potential social and cultural changes that may arise in collective farming communities, and how can they be addressed to foster cooperation collaboration?

People are divided by political parties now. But in the villages, people have usually a bonding, and they prefer to follow the rules of FPOs. So in such cases, we can successfully continue the culture. Agriculture and culture are great assets of India, and we can revive the potential of traditional agriculture wisdom and lead a natural life. Nowadays, many rich people long for the lifestyle of a farmer, taking care of crops, and living in a small and cool hut. Through the collective model, we can revive Indian traditional agriculture, and it will set the cultural practices too by celebrating festivals in the villages.

How does the collective farming impact the livelihood and wellbeing of rural communities, and what strategies can be employed to ensure equitable outcome?

It provides a lot of rural employment opportunities. Instead of buying factory made produce, the villagers can produce all the inputs needed for agriculture, monitor, and execute the projects. They can get employment with the value addition and processing of produce, and villagers can be part of produce marketing too. There are lot of agricultural opportunities. This is the way forward for India as far as agriculture is concerned.

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Mr Pradyumna Sumant Athalye

Farmer and Professional Agricultural Consultant,
Badlapur, Maharashtra

Explains how to set up mango and cashew organic farming.



We, initially to start with, need to identify where we want to start, identify the market where we want to sell as the market is very much dependent on supply of fresh fruits, frozen fruit, processed fruits, and other products related to food. If we can fix the market, local or community market, Agri produce market, friends circle market, or any platform market like NGO, foundation, and other private market or mandis, we can start.

In Konkan, though many places are hilly, farmers are still growing organic mango. We can have two plans for mango cultivation – one is to prepare early in December and the other one is to prepare in March. In the first plan, we can do the harvest from January or February. The fruits will get very good price, and in the second plan, the fruits

are ready for harvest by April second week. At that time the market settles for specific mango fruits. In regular market, the cost shows upward and downward trend, while the organic market has no such fluctuation. If we want to take advantage of December season with flowering in November and December, the fruit will be available in February. It is difficult to harvest in February. In natural way, the land gets ready to produce flowers in December or January because the season for mango start in winter season. Very good winter season will produce good quantity of flowers in mango plant. With good rain, pure air, soil, and water, the circle starts from summer and ends in summer. So when we go organic, we need to think which market we look for.

When we go for second plan, the organic farming will get the produce for the market in the natural method.

We have to think about natural conditions, plants environment, and many such things. When we produce organic way, market is the top one to consider, then availability of fruits for which we have to follow punctual practice. We have almost 8 months to practice mango farming. Monsoon starts in June, July has heavy rainfall, and in August, it settles down. So we have to start mango practices such as foliar and drenching. We have to take care of problems like water stagnation, labour issues, and others. We need to calculate the calendar for mango treatment. If not possible in August, at least from September we should start. We have to start spraying for fungicide and pesticide. But we have to start it early if we have to do organic way of farming. Mango is a seasonal fruit, and people are ready to buy it irrespective of the cost. The right season to harvest is April. We have to find out if the market will buy from us during the season.

It is easy to plant in hilly regions because the area will get sun light all through the day and make the plant healthy, proper photosynthesis period, and prevent pests and diseases. We can know about the distance for the plants from the universities locally, the grid, which variety to plant to suit the location etc. We can expect fruits from the fourth year onwards. If we do high density or ultra-high density plantation, or regular grid plantation, we can get good yield. We can use raw salt which is available in plenty in all places and spray the same on the open field. Salt goes deep into the earth, sucks energy from the air, and dilutes the soil. It works as the mediator for the land. It treats the soil easily. If we do not want to use salt, we can use ash that is easily available, especially home made ash.

At the time of plantation or after plantation we can do the broadcasting every 15 days. Or we can use farm yard manure or natural compost or organic compost fortnightly. The compost will maximise the bacterial content in the soil and enrich it with nutrients. We can do this as per the location. We can manufacture compost in our farm using bacteria culture from Kissan centres, universities, or agriculture stores. We



Organic Farming



can get Jeevamruth and other bacteria culture. We can also use buttermilk which serves as good fungicide. We can also use cow urine for good culture. We may need 15 kg per one acre to maximise microbes and bacteria. For plantation purpose, we may need some extra fertiliser and compost as per doses suggested by universities and experts. We have to follow the protocol, and this will help us. After 15 days, we can start foliar spray on mango plant which is ready to produce.

We can use turmeric powder which is a very good fungicide every 2 weeks. We should know that sun gives food for the plants, and moonlight helps the plants to grow. We can implement this technique in natural farming and organic farming. We can use Rhizobium, Azotobacter, Pseudomonas and others to spray on the plants. We

can produce the natural ones in our kitchen itself which will save time, effort, and money. We can also use fresh lemon juice in flowering conditions to get good results. This is because of the natural content in lemon juice which is highly rated and is a tonic base for the flowers. Turmeric powder, cow dung ash, and neem are insecticides too.

Farmers have to maintain our patience to get flowers, market, and soil is the media, and farmers are media based farmers. We cannot easily shift into soilless media. Plant life for mango is almost 30 to 40 years and productive plant. Cashew plant also has the same plant life. After 50 years, the plant will produce or generate some special flavours and taste. In organic and natural way, we can easily produce mango because it is not a tough task. Natural and organic farming are practices that nature helps, and so we need to be patient.

Cashew plant is a highly reliable cash crop. Maharashtra and Konkan region are growing cashew which is easy to grow and take care because the cultivation cost is very low compared to mango. Harvesting is easy, but collection of cashew seeds is tough. Theft is another problem with regard to cashews. Every year we can get the fruits. Since it is a sustainable crop, we can get produce every year. But the cashew is a sensitive crop as the season is a little earlier than mango. It starts from November and December and ends around March or April. If we get rain in February, cashew starts flowering again. So some farmers get double yield. From a well grown tree, we can easily get 60 fruits. Based on the soil, water, and environment, the yield increases. Cashew needs care when it starts flowering as insects attack them. Curing in organic method is better with preventive applications.

How do organic farming practices impact the quality and taste of mangoes and cashews? Can you

explain the specific climatic and soil requirements necessary for successful organic and natural farming of mango and cashew?

When we do natural and organic farming, the taste of mangoes and flavour will get natural. We can see this in Alphonso, Kesar, Dusheri, and other mangoes are examples of this because of their taste and flavour due to organic farming. Well drained soil is important for both crops. Red soil and soil with some stones in the soil are good for producing mango and cashew. In arid regions, those plants depend on rainfall. When we plant them in other conditions, the soil and weather conditions should be suitable. In dry regions, the mango will not get good taste. In humid conditions, mango gets a good taste and flavour too. When we talk about soil, red soil and well-drained soil are very much helpful for both the crops.

How can farmers ensure pest and disease management in organic mango and cashew orchards?

We can find pests and diseases when there are fruits in the plants. It is a natural food cycle. We have to control them by organic method using preventive measures such as trap cropping. When we have mango or cashew farm, we can plant maize or sweetcorn in the border, olive plantation or we can plant marigold which is again used in trap cropping. Mustard and other oil seeds such as sunflower, soya bean, and sesame are used as crop trapping to control pests. We have natural and organic way to control and maintain pests and diseases from plants in methods like bio culture, bio produce, biological controls, trap cropping, cow urine, and cow dung. The home remedies will help to control and prevent pests and diseases. If we want to farm in a natural way, the whole food circle will come to our farm. Insects and birds will be part of biodiversity. So if we do trap cropping, insects and birds will



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not attack our fruit plants but will settle in other crops like oil seeds plants olive, neem, and floriculture crops. This is my suggestion for mango and cashew plants.

What organic fertiliser and composting techniques are recommended for promoting healthy mango and cashew growth?

Farmyard manure is the best compost. We can prepare it in our own farm, and we can cut grass in our farm and compost it. Culture is available everywhere to do bacterial culture for composting. If we go to markets, many companies are doing genuinely and selling the best compost. We have fertilisers, compost, and if we have farmyard manure, our cost will reduce, production cost will reduce. When we plan to do natural and organic way of farming, we need 30% more than the regular supply as we are going the manage the same content in organic way. We need to add some contents into the basic fertilisers. When we do regular farming, 100 kg of fertiliser will be enough for one acre, but in organic or natural way, we need to put 30 kg more, which will be 130 kgs we have to apply to the soil.

How do organic farming techniques contribute to the conservation of natural resources in mango and cashew cultivation? What measures should be taken to maintain the quality and purity of organic mangoes and cashews during harvesting and post harvesting processing?

Organic farming techniques will help 100% natural resources because if we cut the grass, the roots will develop almost double and stop soil erosion. They can maintain biodiversity, prevent insect control. We are not killing them, but we are maintaining the plants and biodiversity. So nature will maintain us the organic and natural way. These techniques are certainly helping nature. We have to focus on post harvesting. We should not use any form of powder or other things to ripen the fruits or make

the fruits matured. We need to focus when the fruits get naturally ripened and then harvest. Post harvest, in the natural way, the fruits' shelf life is about 1 week maximum. So we need to calculate our market and fix the same. Then go for plantation. If we have plantations already, we can develop market locally. The natural way is to use local grass, green fodder or dry fodder to ripen the fruits. Natural farming or organic farming does not allow us to attach or use any powder or smoke for ripening. Quality of the soil is the first focus. If we take care of the soil, it will take care of all the other things.

What certifications should organic mango and cashew farmers get to market their produce?

We should get the certification to get good price for the produce. ECOCERT, National Agency, and government agencies are giving certificates. Organic certification on soil health, and plant health certification are needed. We need to follow the government guidelines to get the certification for organic farming. Each company has its own method for the certification. If we have to sell the produce at a good price, we have to get the certification.

What are the economic benefits of organic mango and cashew farming compared to conventional methods?

In conventional method, the plant reproduction life is 25 years. With organic farming, the life span goes up by another 15 years. It results in economic benefit for the farmer. The plant life and health are in good condition, and so production increases for many years. In conventional method, plant can produce up to 25 years, while in organic method, the plant can yield up to 50 years.

Please explain the role of community involvement and knowledge sharing in promoting organic mango farming and cashew farming practices.

There are many communities, NGOs, agencies which are doing good job in



mango and cashew farming. Some people doing organic farming to do market business, work for farmers, and working on available farm practices such as machinery, ripening conditions, storages, transportation facilities, etc. Overall Mango Growers Association and Cashew Growers Association are working very good to make people aware of the benefits of natural and organic farming. We have to think, activate, and take actions now to prevent food becoming poison. Mango and cashew are the best cash crops in India, and people are working on betterment of the two and better market.

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Dr. V. K. Jayaraghavendra Rao

Principal Scientist, ICAR-IIHR, Bangalore, Karnataka

Talks about startups in horticulture and agriculture.



With bumper production in agriculture and horticulture produce in India, startups have become essential to ease out the market, help the farmers get more income, and other details. For example, nano urea that comes as a 250 ml bottle is now being introduced in the place of a 150 or 200 kg urea bag. The government is taking all steps to reduce the transportation cost, increase the production, and other factors. The startups have the power, growth, ideation, incubation, acceleration, and decline. The startups have to work with these ideas, give solutions to consumers, stakeholders, and so on. With IoT application in agriculture, in IIHR, we have centre of protected cultivation which works with IoT principles, control the humidity, temperature, soilless cultivation, vertical farming etc. We do not need any land to produce

horticulture crops using the technology. We cannot wait for certain seasons to get some specific products. We have the option of production, freezing, deep freezing, etc which can be made use of throughout the year at a less cost. We have to ensure that sowing occurs in the right time to avoid any glut and price reduction or rise. The farmers seeing the price rise in one season tend to go for the same crop again, and they face loss as there will be price drop if there is a glut in the market. The consumers want uniform price and availability throughout the year. So the producers have limitation on one side, and the demand on the other side. There are two factors to agriculture and horticulture that startups can do. one is input factorisation where FPOs should get all the inputs at very reasonable price without any middlemen, and the output should not face glut or overpricing, but benefit the farmers. The startups should ensure

these two factors. They should plan, develop action, analyse, and give the solutions. There are many agriculture value chain startups where the future is self-explanatory, to ease farming process, produce more crop by using technology such as drone for spraying pesticide and capture the data. Anyone can download the Krishi Dev Gyan app with authentication from IFFCO to know about the entire cultivation, production, and marketing process can be known. We have technology driven experiments, innovative products, and services to farmers and consumers. We aim at reducing postharvest loss, and we expect startups to come up to bridge the end to end supply chain so that people are benefited.

Startups can use the technology to provide high quality products to retailers, it can be input front, internet, or ICT service, or it can be crop-centric monitoring with precision Agri drone technology, cloud seeding, and so on. The startup can have a single promoter, but the innovative ideas have to be done with a team of members. It can be microfinance sector where a microfinancier comes into picture and make the finances available with easy formalities. Startups in Indian sector should build efficiency in the Agri produce trade, trade protocol, and cost of production to rule out competition. So the market intelligence should be used to provide the data to the farmers, consumer. They should measure business models under higher unit economics, profit orientation not by increasing price but by increasing volume of sales, getting good number of customers, reduce cost, and build business model that is stimulating than displacing conventional value chain. When we use reverse value chain, it benefits farmers. All startups should work for everyone. The Green Revolution is said to have worked for big farmers only, and the technologies were not on an economical scale. But now with mobile IoT, farmers get the data driven realistic time approach, measurable, smart and real time decision making.

To name a few startups that are working successfully across the globe, SOSBio develops sustainable agro

chemicals like our nano urea. Today many of the soil application things have become foliar application, and micronutrients are delivered through foliar applications. IRRIoT is another irrigation based IoT based startup, and Jain Irrigation System in India works on the same line. In IIHR we do cultivation in off season also. Foris is another startup which works on precision agriculture and is highly data driven. They have automatic weather station, prediction of humidity, and when fungal diseases will start. Recently we conducted an experiment in Koppal where 500 farmers used their biofortified bajra HR 1000 from harvest place where we got 100 ppm of iron which is usually 40 ppm in other bajra. This helps pregnant and lactating mothers who are extremely anaemic. Babilonia is another startup working on urban farming. IIHR now has vertical farming, soilless cultivation with wick system. We have Dahlia Robotics trying to use robotics in agriculture and sensor based applications. This can tell the farmers about moisture, field capacity, water level, and the precautionary measures they should take. I have written a book Farmers Empowerment and Entrepreneurial Development Through FPOs and Startups where all the details are available.

We have many innovative products like jackfruit seed powder, mushroom powder, etc which ensure nutritional security too. The startups can take license and work on these. When I say FPO or startup, we have to build a market. We have many in the production front but few who can take



it forward through supply chains and distribute in the market. A cluster of Farmers Interest Group or Women's Interest Group can become startups, take the products to the local market and urban market and finally global market. The startup will work only on building the market, give low cost solution to the farmers. For example the fruit fly detection system which finds out the fruit fly eggs in the fruits which become not marketable. So these fruits can be separated from the others. The startups will work on an inclusive value chain which is technology enabled, partnership, and market oriented development. By delivering good quality mango to the people, using ICT for extension, having e-contracts, and demand forecasting on the technology ecosystem as we have to do processing and branding. There are courses which the farmers can use to improve their awareness and not be ignorant. When we bring the innovation and intervention, we can reach the desired situation. Now we have products neatly packed and graded with price tags or RFIG tag where date of packing is noted. People can find out the details.

By using a QR code or RFIG tag, we can find out where the spoilt products are delivered from. Startups can work on Agri insurance also.

A startup basically comes with an innovation to use technology keeping the intellectual properties rights, regulatory rights, and formed by Companies' Act, market linkage and other support are taken care of. The startup will work on low cost solution, high sales value to achieve breakeven and achieve fixed cost. This is how the startup ventures are started as people are slowly losing interest in jobs with salaries. The startup mantra will be to reach larger audience and get success stories.

They have to convert opportunities into profit. The startups can visit villages who have been preserving seeds and make a National Participatory Seed Grid. The plant varieties should be not just nutrient sensitive but also climate sensitive. Farmers can get seeds from the seed grid. Startups can use trees on farms to generate food and cash and make it sustainable livelihood for rural areas. They can also encourage pollination process.

Startups can enter input, harvesting, growing stage, packing, transformation stage, trade, and consumption. They can enter at the micro and macro level based on the business volume and investment to convert a small opportunity into good one. Fund is not a limitation now in India. A Startup can intervene when an FPO is unable to get remunerative prices and has intermediary problems with less knowledge. They can help





Startups

in employment, funding, and help to take advantage of the ecosystem. They can also help in certification of organic products. Now, we need lot of startups to work on value chain. Why do startups fail? It is because they are established where there is no market need, too much of investment, lack of backup, more competition, and lack of novelty. Pricing is another issue, poor quality product, and lack of business model on how to integrate a market for the products. States like Karnataka, Telangana, Maharashtra, UP, Tamil Nadu are doing good job while many other states are not getting good promotion and unrest. The startups' success lies in innovative products and lack of planning. They should know where to get the capital, invest it, and get ideas.

We can work on hydroponic retail store farming, garlic farming for medicinal purposes, lavender farming, mushroom, bamboo, willow farming, paper from jute waste, and creating wealth from Agri waste. They can work on fortified rice analogues from broken rice and dal, protein isolation from de-oiled cakes of soya beans and groundnut, soilless planting media with sugarcane residue, producing fertiliser using coir pith and dried cow dung, recycling food waste to prepare compost, etc. For many products, commercialisation has started from ICAR, licence given, and start the business. Detailed project plan, business plan, and marketing plan are needed for FPOs and startups. Credit linkages using ABPU can be used to get funds up to Rs. 5 crores at 3% interest. Paying GST, GAP certification are also needed.

How can startups ensure fair and ethical labour practices when dealing with labour intensive farming activities? What are the typical funding sources and investment opportunities available to horticulture and agriculture startups, and what are the criteria investors



look for?

Most of the startups are technology oriented and do not employ labours unless it is a skilled work. There are many manpower contractors, and the startups need not employ labours directory to pay pension and gratuity landing in labour problems. Government of India has AIIF where minimum Rs. 5 crores is given at 3% interest. There are angel investors, bootstrappers, and not much of fund is required, it is the innovative idea that is needed. The startups should check the demand for the product in the area, vertical farming, silage cultivation, nutrient mixing, and wick system. They should be technology intensive, and horticulture technologies are not money oriented. We can upscale them by investing more money after sometime. Initially it needs sound knowledge of horticulture and science.

How can horticulture and agriculture startups collaborate with traditional farming to create synergies and foster growth?

I know of a person who has only 2 to 3 acres of land for himself, but he uses the farmers in his area to produce very high value vegetables, takes care of inputs credit, harvesting, and marketing. He gives incentives for packing grading, and branding. Thus he is able to aggregate small and marginal farmers, link them up, and put them in a startup value chain and supply chain. If I am in Doddaballapur area, I will not bring labours from Kerala or Andhra. I will be using local resources, engage in participatory breeding, contacting local agriculture universities and KVVKs. I will use the local people, but

I will be adding some knowledge skill and attitude for them and help them to become mini entrepreneurs to become startups later.

What are the challenges in horticulture and agriculture startups, and how they can be overcome? What are the key considerations for scaling the startups from small operation to larger and impactful one?

The main challenge is the Agri produce are perishable, then variation in prices, and labour force is not an organised one in agriculture sector. So we have to solve these problems to convert the products into high value ones and earn profit. Usually the customers are in cities, and they should be the targets. We should produce in villages and market in cities using marketing channels and network. We should make use of cold chain to transport the products. So we should take care of the supply chain, network, cold chain, take a warehouse pay the rent, and start the business. This is how it should be done.

Can you share some success stories of horticulture and agriculture startups that have made significant impact in the industry?

Waycool is a good startup who does the procurement from a cluster of villages, give them input credit, get the production done, and do the entire marketing through warehouses and minimum markets. So even Amazon foods does the same thing. They outsource the products from many villages and do the marketing, packing, etc. Bigbasket is another example. These are aggregate startups who invest on ICT part and marketing part, products come from the village, and of course this is a Herculean task.

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Mr Prateek Kumar Tiwari

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Discusses about aquaculture and the management.



Aquaculture management is essential in agriculture sector as it helps in water utilisation and saving crops in the fields. It is important that we manage the aquaculture and manage the water which is a main rule in aquaculture management. We have to understand the present status of aquaculture and challenges in the sector, constraints, and prospects for fish and prawn farming in both global and Indian perspective. To maintain the GDP, role of agriculture is important, and aquaculture has a major role in balancing the GDP growth in agriculture and India. There are development processes, supports, and driving factors for production enhancement. As per the data 2020-21, the total production of aquaculture in inland water bodies is 11.5 MN MT and marine water bodies is 78.8 MN MT. Total capture is 90.3 MN MT. By 2025, we hope to take the production

to a higher level. The per capita consumption of fish is 20.2 kg each year. The trade fish export is 59.8 MN MT. Since the quality fish is good, it plays a great role in improving our GDP and farmers' income.

From the data about aquaculture production, we come to know that there is a steep rise in production, consumption related to population, and per capita consumption. India currently stands 6th among the world countries. PM Matsya Sampada Yojana targets the production level to increase better, but it is a challenge for the Indian farmers. We have to maintain the production of aquaculture between 5 to 10%, which is a challenge for the country, fishermen, and society.

In temperate areas, the production is 35.19 MN MT at a percentage of 45%. The tropical areas the production is 26.73 MN MT at 34%, upwelling areas with production of 16.41 MN MT at 21%, and marine water 78.79 MN MT. We can see the sharing of percentage among various regions. The marine capture production includes major species of finfish anchoveta, engroulis ringens, Alaska pollock, *Gadus chalcogrammus*, skipjack tuna with a total of 66734 tons. Crustaceans natation decapods net, gazami crab, akami paste shrimp form 5625 thousand tons.

The top major species produced in world aquaculture include grass carp, silver carp, Nile tilapia, common carp, bighead carp, catla, carssius, clarius catfish, striped catfish, and rohu which contribute around 49120.5 thousand MT. Of them Clarius catfish comes to 2.5%, grass carp and silver carp form

11.8% and 10% of total production. It is important to know that inland water capture production in China is 1.46 MN MT and forms 13%, India 1.80 MN MT. This totally depends on land water production. There are many major producing countries among which India stands first.

We can get all the data from India Handbook of Fisheries Statistics 2022. It provides all statistics about brackish water fisheries and other details about the current status of aquaculture in India. There has been a steady increase in fish production in India from 1980 -81 to 2021-22. There are many factors that have a role in this steady increase. We get all the data from state government, Union Territories, Department of Fisheries, and these help us understand marine and inland production which are placed at 162.48 lakh tons with percentage of 18.7% and 7.76% respectively. As per the graphical representation, many states contribute well to fish production. Madhya Pradesh, Chhattisgarh, Odisha, Andhra Pradesh, Goa, and Karnataka, and each state participates in improving inland fish production.

Specific species like major carps, minor carps, exotic carps, Murrell, catfish, and a few more are cultivated in states and union territories such as Andhra Pradesh, West Bengal, Uttar Pradesh, Odisha, Bihar, Chhattisgarh, produce the carps fish more. Madhya Pradesh produces 1.91 lakh major carps, and minor carps 0.13 lakh tons. Major fish consumption is seen in Tripura, Kerala, Manipur, Odisha, Assam, and Madhya Pradesh.

The data from the government has a table which shows per capita consumption of prawn in each state since 2011, quantity in kg in rural and urban areas of the states. We have 47 major fishing harbours in India. Our fish production grows continuously, and it helps in improving the GDP. The fishery sector contributes 6.72% to the GDP with a turnover of 586.48 crores. It helps in improving the income of the farmers also.

Apart from the advantages of fisheries sector, it also faces lot of challenges, prominent among them being lack of



Aquaculture

funds, inadequate knowledge on fish and prawn farming, stunted growth, irregular water supply, predators, drought, lack of transport, theft, lack of manure, floods etc. There are a few schemes introduced to tackle the problem of lack of funds. Farmers are not literate enough to know about fish and prawn farming, so they face lot of problems, and ultimately lose interest in the culture of fish and prawn cultivation. Many areas in India are not connected to regular water supplying water bodies which is an important part of aquaculture. Attacks by predators also take a toll on the culture and production. Often it becomes a hard work for the farmers to save the culture from attacks by predators. Drought is another dangerous condition for aquaculture, and lack of transport affects transporting the yield to the market. Apart from these, theft, lack of manure, and floods also affect the sector badly. It is our prime duty to manage to solve the problems to save the yield.

There are many culture technologies for fish and prawn farming. Partitioned aquaculture system includes cage culture where we build cages to save the culture, pen culture, composite fish culture, raceway system, bio floc technology, recirculatory aquaculture system, and integrated multitrophic aquaculture. Pen and cage culture are widely used in fish and prawn culture practices. Bio floc technology is often correlated with fisheries. RAS system is a new one and is highly successful. IMTA is very important as we can practise the same in any condition for fisheries farming. We can use the waste material for the benefit of aquaculture. Recirculatory aquaculture system is used in locations where space and water are limited. It minimises the volume of effluent, facilitating waste recovery with increased control over the circular movement especially indoors and improves



biosecurity, and is environmentally sustainable. Bio floc technology is very important in the current scenario. It is a new and expensive technique where toxins and selfies can be converted into protein rich foods such as nitrite and ammonia. It is a method used in aquaculture system with high stocking density and strong aeration. It is helpful in limited or zero water exchange under biota formed by bio floc. These are turning points in the current scenario.

Intensive and synergistic cultivation is possible when using water borne nutrients and energy transfer. Multitrophic means the various species at different trophic levels and different links. IMTA provides the bioproduct in waste water from one aquatic species as inputs to another. IMTA system uses the components such as seaweed and molluscs and extract the nutrients from the effluents to the feed components for fish or shrimp. Raceway system is also known as flow through system which is a simple one. It is an artificial channel used in aquaculture to culture aquatic organisms. It consists of rectangular basins or canals constructed with concrete and equipped with inlet and outlet. The flow through is maintained to provide the required water level which permits the fish to be cultured at a higher density within the raceway. Fresh water species like trout, catfish, and tilapia are commonly cultured in Raceways. It has a vital role when there is lot of water area present in the environment.

What is aquaculture, and how does it differ from traditional fishing?

Aquaculture is water growing. We have seen water present in dams and reservoirs and have the capacity to hold. We use this type of water in culture system for fisheries. It plays a major role in production system and generate income. It carries higher GDP percentage with agriculture. It is like a culture system but related to water culture. Aquaculture is based on aqua system, while other systems are based on other systems.



Aquaculture

measures be implemented in aquaculture farms?

Farmers often witness the cultures being attacked by diseases, parasites, and other diseases which is dangerous for the health of the fish and income of the farmers. So we have to do regular maintenance of the water body, check the quality parameters, have knowledge of the farming techniques. Some training to impart knowledge about fisheries can save us from huge damage both financially and ecologically.

How does the choice of species impact aquaculture management strategies?

We should know fully about the species, culture qualities, the conditions good for the species which differ from state to state and area to area. There are different forms of fresh water aquaculture which plays a major role, and it should have good habitat conditions to grow well.

What role does water quality management play in successful aquaculture operations?

Water quality is essential for aquaculture operations. The overall maintenance of pH levels and other factors that indicate the water quality, if it is in good condition or bad condition is a primary requirement. We need to be alert before any harmful disease spreads in water to attack the culture. We should constantly monitor pH, dissolved oxygen content, biological conditions, and other parameters before growing fish culture. It will be greatly helpful if we can do the tests before the culture development as these parameters are needed for better analysis of water.

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What are the main reasons for the growth of aquaculture as a global industry?

When we support farmers at all levels, schemes like PMMSY also help in farmers' growth and related to fisheries culture. We know that the term relates to the particular type of farmers' income, and also there are many challenges such as lack of funds. When we provide the fund to the farmers, it creates a large amount of growth and production. This in turn plays a major role at the global level and helps in improving our GDP and strengthens our country.

The scientists and farmers should understand importance of fishery as it will create a huge potential in the field of aquaculture which will lead to better life and improved GDP at the global level. It will also help in narrowing down the gap in feeding the hungry at an affordable cost as lot of food requirement is expected in the coming years with increasing population. This gap cannot be fully managed by only agriculture products. We can create food using this type of culture system. We should have a dual potential to play a major role at the country and global levels, market level, production, and consumption which will cater to the needs of the human beings.

What are the environmental challenges associated with aquaculture, and how can they be mitigated?

Drought is a major challenge as the water levels in rivers and reservoirs are decreasing due to environmental factors. Some reasons such as distress, maintenance, and management of cleaning up of aquaculture areas are also causing challenges. The imbalance in the ecological system affects the aquaculture and the production which will be detrimental to aquaculture and water bodies.

How can disease management and biosecurity



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New technologies in Agriculture



The integration of new technologies in agriculture is vital for addressing the multifaceted challenges faced by modern farming.

As the global population continues to rise, so does the demand for food, putting immense pressure on agricultural systems to increase productivity while maintaining sustainability. Traditional farming methods alone are no longer sufficient to meet these demands. Here are some key reasons why the adoption of new technologies in agriculture is crucial:

1. INCREASED PRODUCTIVITY AND EFFICIENCY:

Advanced technologies such as precision agriculture, automation, and robotics significantly boost farm productivity. Precision agriculture, for instance, allows for the precise application of inputs like water, fertilizers, and pesticides, optimizing resource use and maximizing yields. Automated machinery reduces labor

costs and increases the efficiency of planting, harvesting, and other farm operations.

2. SUSTAINABILITY AND ENVIRONMENTAL PROTECTION:

Sustainable farming practices are essential for preserving natural resources and reducing the environmental footprint of agriculture. Technologies such as IoT-based monitoring systems, renewable energy solutions, and biotechnology enable farmers to use resources more efficiently and adopt environmentally friendly practices. For example, smart irrigation systems reduce water waste, and genetically modified crops can reduce the need for chemical pesticides.

3. CLIMATE RESILIENCE:

Climate change poses significant risks to agricultural productivity, with increasing instances of extreme weather events, changing precipitation patterns, and shifting growing seasons. Technologies like satellite imagery, AI-driven weather forecasting, and

climate-resilient crop varieties help farmers adapt to these changes by providing critical information and resilient farming options.

4. FOOD SECURITY AND QUALITY:

Ensuring a stable and high-quality food supply is essential for global food security. Technologies such as blockchain enable traceability and transparency in the food supply chain, enhancing food safety and quality control. Biotechnology and CRISPR technology allow for the development of crops with improved nutritional content and longer shelf lives, addressing malnutrition and food wastage.

5. DATA-DRIVEN DECISION MAKING:

The advent of big data analytics and AI provides farmers with valuable insights into crop health, soil conditions, weather patterns, and market trends. This data-driven approach allows for informed decision-making, optimizing farming practices, reducing risks, and improving overall farm management.

For instance, predictive analytics can forecast pest outbreaks, enabling timely interventions.

6. LABOUR OPTIMIZATION:

With labour shortages becoming a common issue in agriculture, automation and robotics play a crucial role in filling the gap. Automated systems for planting, harvesting, and milking not only reduce the dependency on manual labor but also enhance the precision and efficiency of these operations, ensuring consistent and high-quality outputs.

7. ECONOMIC VIABILITY:

The adoption of new technologies can lead to significant cost savings and increased profitability for farmers. Efficient resource use, reduced labor costs, and higher yields contribute to better economic outcomes. Moreover, technologies such as precision farming and automation can lead to more predictable and stable production, reducing the risks associated with farming.

8. INNOVATION AND COMPETITIVENESS:

Staying competitive in the global agricultural market requires continuous innovation. Countries and farmers that embrace new technologies are better positioned to produce high-quality products, access new markets, and meet the evolving demands of consumers. Innovation in agriculture also drives the development of new business models and opportunities within the sector.

In summary, the importance of using new technologies in agriculture cannot be overstated. These technologies are essential for increasing productivity, ensuring sustainability, enhancing resilience to climate change,

improving food security, enabling data-driven decision-making, optimizing labor, ensuring economic viability, and fostering innovation. By embracing these advancements, the agricultural sector can better meet the growing global demand for food while safeguarding the environment and supporting the livelihoods of farmers.

List of new technologies now in use:

1. PRECISION AGRICULTURE:

* Example: John Deere's precision farming equipment uses GPS and sensors to enable precise planting, fertilizing, and harvesting.

* Details: Precision agriculture involves using technology to collect and analyze data on soil conditions, crop health, and weather patterns. This data is used to make informed decisions that optimize the use of resources such as water, fertilizers, and pesticides, reducing waste and increasing crop yields.

2. DRONES:

* Example: DJI Agras drones are used for spraying pesticides and fertilizers, as well as for monitoring crop health.

* Details: Drones equipped with high-resolution cameras and sensors can capture detailed aerial images of fields. These images help farmers monitor crop health, detect pests or diseases early, and assess the effectiveness of treatments.

3. IOT (INTERNET OF THINGS):

* Example: Smart irrigation systems like those from Netafim use IoT sensors to monitor soil moisture and weather conditions.

* Details: IoT devices in agriculture include soil moisture sensors, weather stations, and connected machinery. These devices collect data and transmit it to a central system, enabling real-time monitoring and control of irrigation, fertilization, and other farm operations.



4. GPS TECHNOLOGY:

* Example: Trimble Agriculture's GPS systems help farmers with field mapping, soil sampling, and tractor guidance.

* Details: GPS technology allows for precise mapping of fields, which is essential for precision agriculture. It also guides tractors and other machinery, ensuring accurate planting and efficient use of inputs, reducing overlap and gaps.

5. AUTOMATION AND ROBOTICS:

* Example: The LettuceBot by Blue River Technology uses machine vision to identify and thin lettuce plants autonomously.

* Details: Robotics and automation in agriculture include self-driving tractors, robotic harvesters, and automated milking systems. These technologies reduce labor costs, increase efficiency, and ensure consistent quality in agricultural operations.

6. BIOTECHNOLOGY:

* Example: Bt cotton, a genetically modified crop, produces a toxin that is harmful to certain pests but safe for humans.

* Details: Biotechnology involves genetic modification and molecular breeding to develop crops with improved traits such as pest resistance, drought tolerance, and enhanced nutritional value. It also includes the development of biopesticides and biofertilizers.

7. ARTIFICIAL INTELLIGENCE (AI) AND MACHINE LEARNING:

* Example: Taranis uses AI to analyze high-resolution aerial images for crop





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health monitoring and pest detection.

* Details: AI and machine learning algorithms process data from various sources to provide insights on optimal planting times, pest and disease outbreaks, and yield predictions. These technologies help farmers make better decisions and improve overall farm management.

8. SATELLITE IMAGERY:

* Example: Planet Labs provides satellite imagery that helps farmers monitor crop health and detect issues such as drought or pest infestations.

* Details: Satellite imagery offers a broad and detailed view of agricultural fields, helping farmers monitor crop growth, assess soil conditions, and track changes over time. This information is crucial for making informed decisions about resource allocation and crop management.

9. VERTICAL FARMING AND HYDROPONICS:

* Example: AeroFarms operates vertical farms that use aeroponic technology to grow crops indoors without soil.

* Details: Vertical farming involves growing crops in stacked layers, often indoors, using controlled environments. Hydroponics is a method of growing plants without soil, using nutrient-rich water solutions. These techniques optimize space usage, reduce water consumption, and allow for year-round production.

10. BLOCKCHAIN TECHNOLOGY:

* Example: IBM Food Trust uses

blockchain to trace the journey of food products from farm to table, ensuring transparency and safety.

* Details: Blockchain technology creates a secure and transparent digital ledger that records transactions along the supply chain.

This ensures traceability of food products, enhances food safety, and builds consumer trust by providing verifiable information about the origin and quality of agricultural products.



11. CRISPR TECHNOLOGY:

* Example: Researchers have used CRISPR to develop rice varieties that are more resistant to diseases and pests.

* Details: CRISPR-Cas9 is a gene-editing tool that allows scientists to make precise changes to the DNA of organisms. In agriculture, CRISPR is used to enhance crop traits, such as improving resistance to diseases, increasing yield, and developing plants that can thrive in challenging environmental conditions.

12. SOLAR POWER AND RENEWABLE ENERGY:

* Example: Solar-powered irrigation systems like those from SunCulture provide sustainable water management solutions for farmers.

* Details: Renewable energy sources, such as solar panels and wind turbines, are used to power agricultural operations, reducing reliance on fossil fuels and lowering greenhouse gas emissions.

Solar-powered irrigation systems, for example, use solar energy to pump water, making irrigation more sustainable and cost-effective.

13. BIG DATA ANALYTICS:

* Example: The Climate Corporation's FieldView platform uses big data to provide farmers with insights on weather patterns, soil health, and crop performance.

* Details: Big data analytics involves collecting and analyzing large volumes

of data from various sources, including weather data, soil samples, and crop sensors. This analysis helps farmers make data-driven decisions, optimize their practices, and improve yields by identifying trends and predicting future conditions.

These technologies collectively contribute to more efficient, sustainable, and productive agricultural practices, addressing the challenges of feeding a growing global population and adapting to changing environmental conditions.

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Top 10 Technologies In Precision Agriculture

Many media companies regularly rank their favorite or most important developments for the past year in various Top 10 lists because they provide a nice snapshot of what’s been taking place in a particular marketplace.

1. GPS/GNSS

It’s hard to tell exactly where the state of precision agriculture today would be without GPS — literally. From virtually the moment agriculture gained access to position locating satellites in the 1990s, operators and manufacturers have found various ways to tie into these tools to make managing field work much easier and accurate. “In North America and Europe, growers can turn on the tractor and get to work almost immediately,” says T.J. Schulte, Marketing Manager for Trimble Agriculture Division.

Looking beyond these capabilities, experts say that satellite technology is truly deserving of its “global” moniker. “No longer can we refer to all these systems as GPS — that’s not an accurate description when referring to new Global Navigation Satellite Systems (GNSS) receiver technology today,” says Greg Guyette, President of Insero. Instead, he adds, GNSS covers all countries’ satellite constellations including GPS, GLONASS, and Galileo.

2. MOBILE DEVICES

After figuring out where precision agriculture stands on the planet, the next most important innovation these past 20 years would have to be the development of mobile devices. The world today would be an entirely different place without them, according to Illinois Grower John Reifsteck. “Without the cell phone, we probably would still be sitting in the barn a lot, waiting for someone to come to the barn and make things work,” says Reifsteck. Today, cell phones have morphed into a whole host of useful mobile devices including smartphones and tablets. So ingrained has this technology become that experts estimate that there are more mobile devices on today — 7.25 billion — than people (around 7.2 billion). As of 2016, most precision agriculture manufacturers that dabble in the mobile devices market have spent most of their time trying to expand the capabilities these products can offer to users. “We run our business on the 20-minute rule when it comes to getting information to the user,” says Dr. Marina Barnes, Vice President of Marketing for FarmersEdge. “If you can’t get your technical data to work for the farmer within the first 20 minutes after he receives it, he’s probably never going to use it.”

3. ROBOTICS

Robots are taking on many tasks in agriculture these days (with varying levels of success), including planting greenhouse crops and pruning vineyards. And there’s been no shortage of activity in agronomic crops. The biggest push has been for autonomous machines that are remotely controlled using telematics. Kinze engineers have created an autonomous grain cart system (designed to plug into any tractor) in which the cart follows a combine through the field at safe distance.

Launched in 2011, AGCO’s Fendt Guide Connect leader-follower technology also connects two machines by means of GNSS signal and radio, so that both can be controlled by just one driver. AGCO is continuing to develop the concept based on customers’ input on their farming needs, says Sepp Nuscheler, Fendt Senior Communications Manager at AGCO.

1. GPS/GNSS



2. MOBILE DEVICES



3. ROBOTICS



4. IRRIGATION





Special Feature

5. Internet Of Things



6. Sensors



7. VRA Seeding



8. Weather Modeling



In a different approach, the Fendt MARS (Mobile Agricultural Robot Swarms) project utilizes small corn seeding robots that are lightweight, energy-efficient, highly agile, cloud-controlled and operated from a tablet app. There's no cab but one off-field operator managing a fleet of multiple MARS units. They can work around the clock and have low maintenance needs. "Look for some exciting developments to be shared on the MARS project in Q4 of this year," says Nuscheler. "This is one direction we see the future of ag robotics heading — small but smart and many."

4. IRRIGATION

Innovations in precision irrigation technologies are growing even more crucial as growers face water scarcity due to drought, aquifer depletion, and water allocations. One recent advance is telemetry, says John Campbell, Manager of Technology Advancement and Adoption with Valley Irrigation. Products now allow growers to remotely monitor and control nearly every facet of their irrigation operation. The systems save water, time, fuel, and wear and tear on vehicles.

In the future, Campbell says producers will be integrating soil moisture monitoring, weather data and variable-rate irrigation (VRI) into their systems.

Ze'ev Barylka, Director of Marketing and Sales at Netafim USA, adds Precision Mobile Drip Irrigation as another major advance. PC dripline is pulled through the field by a center pivot or linear move irrigation system. As the driplines are pulled behind the system, the integrated emitters deliver a uniform pattern across the full length of the irrigated area. Because the driplines deliver water directly to the soil surface, evaporation and wind drift are virtually eliminated, allowing more water to reach the root zone.

5. INTERNET OF THINGS

One of the newest buzzwords to hit precision over the past few of years is the "Internet of Things" (IoT). Simply defined, it's the concept of connecting any device with an on/off switch to the Internet (and/or to each other). This network of connected things could also include people with wearable devices. The idea has been demonstrated in the consumer market in the "connected home," for instance, where appliances, security systems, and the like communicate with each other and the homeowner. Craig Houin, Data Management Lead at Sunrise Cooperative, says connected components in agriculture could include field sensors (for logging real-time weather, soil moisture, and temperature data) and aerial/satellite imagery for field monitoring. Such device communications could also be used in dispatching programs, sales interaction tools, and other business management applications.

Most recently, a number of ag start-ups and component suppliers (hardware, software, etc.) are using LPWANs (Low Power Wide Area Network) in place of or to augment cellular networks in wireless data transmission. "These networks are designed to carry small amounts of data transmitted intermittently over long ranges," says Paul Welbig, Director of Business Development at Senet Inc. Because the devices that communicate with the LPWA networks do so with very low power, their battery lives are substantially longer than the current cellular offerings. This coupled with low cost network usage provides a very compelling total cost of ownership advantage over other options.

6. SENSORS

Wireless sensors have been used in precision ag and/to gather data on soil water availability, soil compaction, soil fertility, leaf temperature, leaf area index, plant water status, local climate data, insect-disease-weed infestation, and more. Perhaps the most advanced and diverse technologies to date are found in water management. Across the country, increased regulation of water use and water scarcity will continue to drive improvements in this area. In fact, BCA Ag Technologies' Ben Flansburg says soil moisture and rainfall sensors have been some big sellers. And many more producers in California are using moisture sensors to help irrigation scheduling.



On-the-go sensor information has become more valuable as well. On-board applicator options developed over the past few years include GreenSeeker (Trimble), OptRx (Ag Leader), and CropSpec (Topcon). They communicate real-time crop health conditions to help immediately tailor product applications.

Another innovation? WeedSeeker, Trimble’s weed detection sensor made for precise site-specific application of herbicides. “Its use is growing in geographic regions where weeds have developed a tolerance to standard glyphosate-based broad spectrum herbicides,” notes Mike Martinez, Marketing Director.

7. VRA SEEDING

Given all the newer/exciting technologies for precision agriculture on this list, it might be a surprise to see variable-rate application (VRA) seeding here. According to Sid Parks, Manager of Precision Farming for GROWMARK, this has been able to maintain its importance in part because of its nature. “It appeals to a growers’ natural inclination to try to maximize a field to take advantage of all of the possibilities of increasing the yields possible by paying extra attention to the factors that impact seed growth,” says Parks. “It’s a little different than variable-rate fertilizer because VRA seeding relies on your ability to gather accurate data for the start of the agricultural process, the seed itself.”

Another factor working in VRA seeding’s continued importance to overall precision agriculture is the fact it as a category has plenty of room to grow. “Although folks have been using VRA seeding practices since the mid-1990s, it still is probably only being used on 5% to 10% of the planted acres today,” says Parks. “But the ability to gather good, useful data for VRA seeding is getting much better, so the chances of more growers using this practice in their yearly operations will continue to improve going forward.”

8. WEATHER MODELING

Visit most of the nation’s ag retail locations and chances are some kind of weather tracker will be on display. Perhaps no other variable is as important — and completely unpredictable — as the weather.

But help is on the way. “Over the past 25 years, you’ve gotten a lot of important technologies developed that would be even more valuable with quality weather modeling, but we are now at a point where assuring good crop yields is key to making certain the world has food solutions that work,” says Jeff Keiser, Vice President of Strategic Sales and Marketing for Iteris. “Here at Iteris, we’ve been in the data modeling business for more than 30 years. Our first agricultural system, ClearAg creates a platform for agriculture and expands into other modeling areas such as water use, soil properties, and crop growth.”

An example of this, says Keiser, involved a potato grower in the Northern Plains that found harvesting his crop at a certain temperature was key for maintaining crop quality and integrity. In the past, this grower sent scouts out into the field to manually assess soil temperatures before sending in the harvest equipment. “But by using ClearAg, this grower was able to take all their soil readings remotely and he was able to accomplish his harvest a lot more efficiently than ever before,” he says.

9. NITROGEN MODELING

Although some forms of variable-rate fertilizer have been used for decades, nitrogen modeling has become more pronounced recently. “Our clientele has been using variable-rate technologies for fertilizer applications since the mid-1990s,” says Matt Waits, CEO for SST



Software. “However, the complexity of the nitrogen cycle and how it is in a constant state of flux has always made managing nitrogen difficult.”

Recently, SST Software has partnered with Agronomic Technology Corp. (ATC) to introduce Adapt-N. According to ATC CEO Steve Sibulkin, Adapt-N was first introduced in 2014 and is becoming an important tool for properly managing nitrogen use. “There’s a belief in agriculture that today’s environmental pressures will only get worse as the industry moves forward,” says Sibulkin. “The vast of majority of growers want simple methods to use to be able to address these concerns. That’s what Adapt-N and other nitrogen modeling processes are currently bringing to the table.”

10. STANDARDIZATION

The call for compatibility across equipment manufacturers’ components



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— primarily through ISOBUS standards — continues to go out. Official initial efforts to implement this began about eight years ago with the formation of the Agricultural Industry Electronics Foundation. The group now includes more than 170 companies, associations, and organizations that are actively collaborating to make the standards work.

Industry participants that have to deal with equipment compatibility “on the ground” continue to be frustrated, however. Third-party tech experts often struggle to manage competing suppliers’ products. Says Tim Norris, CEO of Ag Info Tech, LLC, Mount Vernon, OH: “There will be a point hopefully where components get to be pretty much plug-and-play — and it’s a lot better than it was — but it’s still a real issue.”

Source : <https://www.globalagtechinitiative.com>



Internet of Things in Agriculture



What is IoT and how is it implemented in agriculture?

WHAT IS IOT? - THE SIMPLE EXPLANATION

What is IoT? - THE SIMPLE EXPLANATION
We are witnessing unprecedented levels of adoption of technology in Agriculture. There are many emerging technologies in agriculture that seem very promising for the future of farming. IoT was once an emerging agri technology and now it has taken a mainstream position by wider adoption. IoT in agriculture by the simplest of definitions is just that - Internet controlling things.

Every time you look at your smart watch to count calories or ask Alexa or Siri to calculate the value of pie, you are using what is IoT tech. IoT by simplest of definitions is just that - Internet controlling things. IoT devices are 'smart' devices that can transfer data over a network. One of the first network connected devices was a 1982 Coke vending machine at Carnegie Mellon University, which was able to report if the drinks were cold or if there were drinks at all.

What Does IoT Mean?

The term Internet of Things was coined in 1999 by Kevin Ashton, co-founder and executive Director of the Massachusetts Institute of Technology (MIT) Auto-ID



Laboratory, while he was giving a presentation at Procter and Gamble (P&G) as their Brand Manager. The presentation that Ashton made for P&G was meant to introduce radio-frequency identification (RFID) tags to manage the supply chain so that the location and stock at hand of each item coming out of it can be more easily monitored.

Riding the RFID wave, LG Electronics then put out a refrigerator known as the Internet Digital DIOS back in the year 2000 which was connected to the Internet. It kept track of the kind of food items that were stored in it as well as their respective quantities by scanning their RFID tags. Though the Internet Digital DIOS refrigerator didn't sell well because most people thought it was too expensive for their needs, it would eventually pave the way for more house appliances to be managed via internet.

According to Cisco Internet Business Solutions Group (IBSG), though the term was coined in 1999, the Internet of Things was born in between 2008 and 2009 at simply the point in time when more "things or objects" were connected to the Internet than people. Citing the growth of smartphones, tablet PCs, and other smart gadgets, the number of devices connected to the Internet was brought to 12.5 billion in 2010 while the world's human population increased to 6.8 billion, making the number of connected devices per person more than 1 (1.84 to be exact) for the first time in history.

IOT TECHNOLOGIES IN AGRICULTURE

IoT smart agriculture products are designed to help monitor crop fields using sensors and by automating irrigation systems. As a result, farmers and associated brands can easily monitor the field conditions from anywhere without any hassle.

Take a look at the different uses of IoT in agriculture by means of various IoT solutions:

1. ROBOTICS IN AGRICULTURE

Since the industrial revolution in the 1800s, automation



got more advanced to efficiently handle sophisticated tasks and increase production. With increasing demands and shortage of labor across the globe, agriculture robots or commonly known as Agribots are starting to gain attention among farmers. Crop production decreased by an estimated 213 crores approx (\$3.1 billion) a year due to labor shortages in the USA alone. Recent advancements in sensors and AI technology that lets machines train on their surroundings have made agrobots more notable. We are still in the early stages of an ag-robotics revolution, harnessing the full potential of the Internet of Things in agriculture, with most of the products still in early trial phases and R&D mode.

Weeding Robots: These smart Agri robots use digital image processing to look through the images of weeds in their database to detect similarities with crops and weed out or spray them directly with their robotic arms. With an increasing number of plants becoming resistant to pesticides they are a boon to the environment and also to farmers who used to spread the pesticides throughout the farm. An estimated 13,000 kilograms (3 billion pounds) of herbicides are applied at a cost of 1,725 crores (\$25B) each year, thus reducing their overall cost.

Machine Navigation: As remote-controlled toy cars are enabled with a controller, tractors and heavy plowing equipment can be run automatically from the comfort of home through GPS. These integrated automatic machines are highly accurate and self-adjust when they detect differences in terrains, simplifying labor-intensive tasks. Their movements as well as work progress can be easily checked on smartphones. With advancements in IoT in Agricultural and machine learning, these tech-driven motors are enabling Advanced farming using IoT independently with features such as automatic obstacle detection.

Harvesting Robotics: Utilizing agribots to pick crops is solving the problem of labor shortages. Working the delicate process of picking fruits and vegetables these innovative machines can operate 24/7. A combination of image processing and robotic arms is used by these machines to determine the fruits to pick hence controlling the quality. Due to high operational costs, crops that have an early focus on agribot harvesting are orchard fruits like apples. Greenhouse harvesting also finds applications with these bots for high-



value crops like tomatoes and strawberries. These bots can work in greenhouses to aptly determine the stage of crops and harvest them at the right time.

Material Handling: Robots can perform dreaded manual labor tasks working alongside the labors. They can lift heavy materials and perform tasks like plant spacing with high accuracy, therefore optimizing the space and plant quality and reducing production costs.

2. DRONES IN AGRICULTURE

Drones in agriculture are used to enhance and optimize various farming activities such as crop monitoring, crop spraying, soil analysis, and mapping. In fact, agriculture is one of the major sectors to incorporate drones. Drones equipped with sensors and cameras are used for imaging, mapping, and surveying farms. There are ground-based drones and aerial drones. Ground drones are bots that survey the fields on wheels. Aerial drones, formally known as unmanned aerial vehicles (UAVs) or unmanned aircraft systems (UAS), are flying robots. Drones can be controlled remotely or they can fly automatically through software-controlled flight plans in their embedded systems, working in coordination with sensors and GPS. From the drone data, insights can be drawn regarding crop health, irrigation, spraying, planting, soil and field, plant counting, yield prediction, and much more. Drones can either be scheduled for farm surveys (drone as a service) or can be bought and stored near farms where they can be recharged and maintained. After the surveys, the drones need to be taken to nearby labs to analyze the data that has been collected, thereby helping leverage IoT in agriculture better.

3. REMOTE SENSING IN AGRICULTURE

Remote sensing in agriculture is revolutionizing the way data is acquired from different nodes in a farm' IoT-based remote sensing utilizes sensors placed along with the farms like weather stations for gathering data, which is transmitted to analytical tools for analysis. Sensors are devices sensitive to anomalies. Farmers can monitor the crops from the analytical dashboard and take action based on insights.

Crop Monitoring: Sensors placed along the farms monitor the crops for changes in light, humidity, temperature, shape, and size. Any anomaly detected by the sensors is analyzed





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and the farmer is notified. Thus remote sensing can help prevent the spread of diseases and keep an eye on the growth of crops.

Weather conditions: The data collected by sensors in terms of humidity, temperature, moisture precipitation, and dew detection helps in determining the weather pattern in farms so that cultivation is done for suitable crops.

Soil quality: Soil health analysis helps in determining the nutrient value and drier areas of farms, soil drainage capacity, or acidity, which allows for adjustment of the amount of water needed for irrigation and opting for the most beneficial type of cultivation. The soil health data can also help leverage regenerative agriculture by providing insights into how and when to increase organic matter and therefore achieve a better soil structure and eventually pave a path for climate-smart agriculture.

4. COMPUTER IMAGING IN AGRICULTURE

Computer imaging involves the use of sensor cameras installed at different corners of the farm or drones equipped with cameras to produce images that undergo digital image processing. Digital image processing is the basic concept of processing an input image using computer algorithms. Image processing views the images in different spectral intensities such as infrared, compares the images obtained over a period of time, and detects anomalies, thus analyzing limiting factors and helping a better management of farms.

SMART AGRICULTURE SYSTEM USING IOT: IN SIMPLE WORDS

IoT device includes every object that can be controlled through the Internet. IoT devices have become commonplace in consumer markets with wearable IoWT (Internet of Wearable Things), such as smartwatches, and home management products, like Google home. It is estimated over 30 billion devices could be connected to the Internet of Things by 2020.

The applications of the Internet of Things in agriculture target conventional farming operations to meet the increasing demands and decrease production losses. IoT in agriculture uses robots, drones, remote sensors, and computer imaging combined with continuously progressing machine learning and analytical tools for monitoring crops, surveying, and mapping the fields, and providing data to farmers for rational farm management plans to save both time and money.

Source : <https://www.cropin.com>



GPS goes down on the farm

Computers and Global Positioning Systems are helping cut costs and increase production at some farms.

Aided by a computer and a Global Positioning System — a constellation of Earth-orbiting satellites — a farmer's tractor can now drive itself. The use of such technology has increased in the past few years as farmers try to cut costs to stay profitable as crop prices remain relatively stagnant. Infrared sensors control how much fertilizer is applied. Retinal imaging tracks cattle. On the horizon, perhaps, are tomato-picking robots.

Experts estimate that up to 15 percent of farmers now have GPS precision-controlled tractors or combines. "It's the difference between making money and not making money," said Dave Mowitz, machinery and technology editor for *Successful Farming*, a national farm publication based in Des Moines, Iowa.

AutoFarm, a company based in Menlo Park, Calif., adapted a \$40,000 GPS system for agriculture from an automatic aircraft-landing system. About 300 have been sold since the equipment went on the market last spring. "Everybody's been looking at that and saying, 'Gosh, can they do it?'" said Thomas Wagner, who was helping demonstrate the GPS precision-curve system at the Farm Science Review near this central Ohio city in September. "Bring your tape measure and we'll show you we can actually do the curves."

GPS receivers placed on top of tractors pull in locational radio signals from satellites and a ground station fed by satellites. A computer inside the tractor memorizes the coordinates of the field and guides the tractor over the same path — for tilling, planting, spraying and harvesting.

High cost makes it a tough sell

Ernie Hatfield, who farms 50 acres near Bethel in southwest Ohio, was impressed with the demonstration. "We're basically just getting introduced to it," he said. "We need it, but it's probably cost prohibitive." Expense is one reason high-tech can be a hard sell to farmers. Some believe that precision-guidance systems make economic sense only for large farms.

"They are slow to adapt," said Joe Malone, who raises hogs near Lancaster and formerly worked in robotics for Goodyear Corp. "Once you get a farmer that looks at what it can do for



him from a standpoint of money — that's all he's looking at. Then he'll buy into that project right now." GPS systems, which began hitting the fields about seven years ago, can cut the loss of herbicide to evaporation by allowing farmers to work at night, when winds often are calmer. And driving over the same route each year minimizes the compaction of soil by the wheels that can reduce yields.

"It allows them to farm 24 hours a day if they want to," Mowitz said. "It can be pitch black, and you can be planting your fields." Dennis Hancock, an agriculture researcher at the University of Kentucky, said precision-guidance systems can save farmers as much as 5 percent in fertilizers and pesticides.

More high-tech tools

Another technology, remote sensing, can reduce the use of fertilizer and minimize runoff pollution. Sensors got their start in the 1980s, but their use has taken off in the past five years. Photodiode sensors mounted on a sprayer absorb the color spectrum being reflected by the plants, and a computer determines how much fertilizer or herbicide to spray. "You're putting more on plants that can use more and not putting as much on plants that can't use as much," Hancock said. "There is sometimes a pretty tremendous economic benefit in that."

Computer/GPS systems also produce maps showing where a field is the most and least productive. Farmers can use more seed and fertilizer in less productive areas or take those areas out of production. As a combine moves through the field threshing corn and spitting it into a bin, a sensor in the bin measures the output while the GPS system marks and records the crop yield in each spot.

Farmers in Kentucky — where the rolling terrain can make for both high and low production in the same field — have saved as much as \$30 an acre by using the yield monitors, Hancock said. The cattle-identification system uses a high-speed digital camera to illuminate and scan the retinas of calves or lambs. The images are loaded into



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a computer, and a GPS signal tracks the animals from the pasture to the slaughterhouse. The equipment, which costs about \$2,700, has been in use for about a year. John Cravens, marketing director for developer Optibrand Ltd. of Fort Collins, Colo., said the system could help quickly identify an animal with mad cow or other diseases. It also provides a profile of each animal, including weight, diet and medical treatment.

For some, it's all a bit much.

Not for small farms

John Ikerd, professor emeritus of agricultural economics at the University of Missouri, said the new technologies will result in larger farms and fewer farm families. Decisions about what and how much to plant will be made by faraway corporate officers whose primary focus is maximizing return to shareholders and not necessarily what is good for the land, he said. More technologies are on the way. Not yet in the fields is the tomato-picking robot. Developed by Ohio State University researchers with a \$100,000 grant from NASA, the single-armed robot has a prosthetic hand and a lipstick-sized camera and is mounted on a portable platform.

Researcher Peter Ling said the camera spots tomatoes and determines their size and color even if they are partially hidden behind leaves or stems. Using a suction cup and fingers that employ a loose grip, the hand plucks the tomatoes from the vine and drops them into a bin. Malone, the Lancaster farmer, said corporate farms might start using such robots in the next two or three years to sort good tomatoes from bad and save money on labor.

"For someone that's farming small, I don't think so," he said.

Source : <https://www.nbcnews.com>



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How Robots are used in Agriculture

The agricultural industry are continually looking for ways to increase output, improve efficiency and reduce waste. This has led to robots and automation becoming an integral part of farming and food production processes.

Application of robots in agriculture

Robots have a wide range of applications within the agricultural industry from performing complex tasks such as monitoring crops and measuring PH levels in the soil, to simpler tasks of picking-and-packing fruits and vegetables and planting seeds. Add to that automation for ventilation systems and air control for livestock, milk production and arable irrigation, and it is clear that technology is the future for successful agriculture. Robots and automation are particularly important for large, industrialised farms where there is a lot of land to monitor and work as well as processing large amounts of crops or produce. Currently robots perform a number of tasks including:

Seeding – Driverless tractors and robots are slowly replacing driver-led

machinery for sowing seeds.

Harvesting – A primary use of robots on farms especially with the current labour shortage often comprises of a robot with picking arms to pick ripened fruit and vegetables.

Packing – Packing fruit and vegetables for distribution to retail is often carried out by the use of a conveyor belt and robotic arms to pack the produce according to type. They can be programmed to identify good from bad produce so only the best ends up in the supermarket.

Palletising – This is normally carried out by a forklift truck and driver and is therefore also automated in many instances using palletising robots or robotic arms.

Crop maintenance – Robots can be programmed to maintain the crops by pruning plants, weeding land, applying

insecticides or nutrients and providing irrigation.

Livestock applications – There are many repetitive tasks involved with livestock farming which can be automated including milking cows, spreading feed and monitoring land for grazing.

Benefits of robots in agriculture

Whilst there is obviously the initial financial outlay when automating agricultural systems there are a number of benefits including:

Productivity – Robots can work quicker than humans and for longer periods without a reduction in productivity, risk of injury or a need for breaks.

Guaranteed workers – With seasonal tasks like fruit-picking it can be difficult to find the staff on time, whereas robots are available to pick the produce when it is ready with no risk of a crop being left in the ground to rot.

Waste reduction – If crops are left in the ground due to staff shortages, or they are not palletised in time for distribution this can result in wasted crops. This won't happen with automation.

Precision – Robots are not susceptible to human error and therefore repetitive jobs (and even more complex tasks) will be done accurately and precisely throughout the entire process.

Cost effective – Although the outlay could be high, with robots running 24/7 this investment is quickly returned, as farms will be working more efficiently, with reduced waste, reduced labour and reduced running costs.

Designing robots for agricultural applications

Motors are a key component that enable robots to be able to perform their tasks, driving their robotic arms enabling them to move, grip & pick to undertake precision tasks.

When designing robots, manufacturers need to ensure that the motors installed with the robot are perfect for the job in hand.

Source ; <https://www.parvalux.com>





Success stories of farmers who have adopted drone technology in India

There were several success stories of Indian farmers who had adopted drone technology to enhance their agricultural practices. Keep in mind that the adoption of drone technology in Indian agriculture continues to evolve, and more success stories may have emerged since then. Here are a few examples:

1. Village-Level Crop Monitoring in Maharashtra:

In some villages in Maharashtra, India, groups of farmers pooled their resources to purchase drones equipped with cameras and sensors. They used these drones to monitor their crops more efficiently. By analyzing the data collected by the drones, they could identify issues such as water stress, pest infestations, and nutrient deficiencies early on. This timely information allowed them to take corrective measures, resulting in improved crop yields and reduced input costs.

2. Rice Farming in Tamil Nadu:

In Tamil Nadu, drone technology has been particularly beneficial for rice farmers. Drones equipped with multispectral cameras were used to assess the health of rice crops. By analyzing the images and data collected, farmers could determine the exact areas that needed more or less irrigation and fertilizer. This precision farming approach led to higher rice yields and resource savings.

3. Tea Plantation Management in Assam:

Tea plantations in Assam, known for producing high-quality tea, have also embraced drone technology. Drones equipped with thermal cameras helped identify and manage issues like infestations and overgrown vegetation. This improved pest control and enhanced the overall quality of tea produced.

4. Fruit Orchards in Himachal Pradesh:

Apple orchards in Himachal Pradesh faced challenges related to orchard management and disease control. Farmers in the region started using drones to capture detailed images of their orchards. These images were then processed to detect signs of diseases and other issues. This early detection allowed farmers to take targeted actions, reducing crop losses and ensuring healthier apple harvests.

5. Sugarcane Farming in Uttar Pradesh:

Sugarcane farmers in Uttar Pradesh used drones to assess the maturity of their crops. By analyzing the drone-captured images, they could determine the optimal time for harvesting sugarcane. This resulted in

better-quality sugarcane and increased sugar production.

These success stories demonstrate how drone technology is being embraced by Indian farmers across various regions and crops. Drones are helping farmers make informed decisions, reduce resource wastage, and improve agricultural productivity. It's important to note that the adoption of drone technology in Indian agriculture is likely to continue growing as more farmers recognize its potential benefits.

Source : <https://medium.com>





Special Feature

5 Examples of Biotechnology in Agriculture



Biototechnology is widely used in agriculture to improve plant growth and yields, increase resistance to pests and diseases, and enhance nutritional content. In fact, it's estimated that up to 80% of all processed foods today contain ingredients derived from biotechnology. From genetically engineered crops to the Sterile Insect Technique (SIT) for insect control on fruit trees and grapevines, examples of biotechnology in agriculture are widespread. In this post, we'll discuss some of the most common examples of how biotechnology is being used in the agricultural sector as well as the advantages of biotechnology.

GENETICALLY MODIFIED CROPS

Genetically modified crops are created by inserting genes from different organisms into the DNA sequence of specific crop varieties. This produces traits that would not occur naturally, such as resistance to pests or environmental conditions like drought. The GMO industry has evolved over the years, with progress being made in developing crops that are tolerant to herbicides, resistant to disease, and insect-resistant.

Many people oppose GMOs because they are not sure about their long-term effects on human health and the environment. However, many scientific studies have suggested that GMOs, as an example of successful biotechnology application in agriculture, are safe for both humans and the environment. More research still needs to be done to ensure that GMOs are safe and beneficial in the long term.

Advantages of GMO biotechnology:

- Increased efficiency and reduced costs
- Higher crop yields
- Ability to generate new food products
- Improved quality of life for farmers

DEVELOPING OF BIOFUELS

Another great example of biotechnology in agriculture is the development of biofuels. Biofuels are types of fuel that can be produced using natural inputs like algae, corn stover, and sugarcane bagasse instead of petroleum products. This helps to reduce greenhouse gas emissions because they do not emit any carbon when burned. It also does not take away from the food supply because some inputs, like algae, can be grown

on wastewater or using arable land that isn't fit to grow crops. This also gives more options for where the fuel source comes from and may increase competition, which could lower prices. Using advanced biotech methods to develop biofuels has the potential to help reduce greenhouse gas emissions and provide a more reliable fuel source.

Advantages of biofuels:

- Reduced greenhouse gas emissions
- Increased competition may lead to lower prices
- More options for where fuel source comes from

IMPROVING PLANT GROWTH

Improving plant growth is another example of biotechnology in agriculture. Since the beginning of agriculture, farmers have been breeding plants to get more desirable traits such as larger fruits size, more robust plant growth, or improved flavor. This is an example of traditional cross-breeding methods where a farmer selects what she thinks are the best examples from each generation for further breeding. In short, this method requires generations of experiments to obtain the desired result.

However, with the advent of biotechnology, sustainable plant growth can be achieved quickly and efficiently. These plants are altered in a laboratory to possess a specific trait, such as resistance to pests, abiotic stress, and several other factors. Once the variety is created, it only takes a few generations for farmers to obtain examples that have all desired traits and grow much more efficiently because they no longer need to worry about previous growth challenges.

Advantages of biotechnology for plant growth:

- Increased tolerance to stress factors, such as drought or salinity
- Faster growth rates and shorter generation times
- Costs less than traditional breeding methods

IMPROVING PLANT SEED QUALITY

We can't mention examples of biotechnology in agriculture without noting the increased quality of seeds



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available to farmers. Biotechnology has allowed for more effective and efficient ways of improving the crops that feed our population, as well as ensuring high-quality seeds at harvest time. Seed quality has always been the basis for a good crop, and biotechnology has allowed seeds to be improved in several ways.

For example, scientists have been able to improve the ability of seeds to withstand different conditions such as drought or flooding by using DNA technology that targets specific genes responsible for water uptake during these stressful times. In addition, biotechnologists have introduced new genetic material into plants that can lead to higher nutritional value in many foods we eat every day, like fruits, vegetables, grains, and oilseeds.

Advantages of biotech in improving seed quality:

- Improved crops
- More food for the world's population.
- Better crop yields in the face of changing conditions around the globe
- Increased nutritional value

IMPROVE ANIMAL HEALTH AND BREEDING

Another great example of biotechnology in agriculture is improving animal health and breeding. Biotechnology is now being used in livestock production, which allows the animals to grow faster with less food for better meat quality. It can even be used for cloning. Animals that are resistant to diseases can also be bred using biotechnology. By using biotechnology solutions, farmers can

increase their production and improve the quality of animal products.

The animal biotech industry has a long way to go, but the potential is huge. This technology has great advantages over conventional methods and may be a key to feeding our growing population in the future. When combined with plant-based biotechnology, the potential for increased food production is even greater. We can only hope that

There's no doubt that biotechnology is here to stay. As scientists continue their efforts to create new technologies, the successful application of these and other examples of biotechnology in agriculture will increase. For instance, farmers who produce fruits, flowers, and vegetables can increase their yields and profits, reduce labor costs, and improve the environment.

Examples include using genetic



this technology will be used to help us sustainably feed the world.

Advantages of biotechnology in animal breeding:

- Improved animal product quality
- Faster growth
- Resistance to diseases
- Increased food production potential

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engineering to develop herbicide-resistant seeds for soybeans, developing genetically engineered apples with extended shelf life, and using CRISPR gene editing to create cows that produce more milk. Learn how biotechnology is changing the agricultural sector at Fruit Growers Supply. Fruit Growers Supply is a one-stop shop for your commercial growing needs. Contact us for a quote.

Source : <https://fruitgrowers.com>



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CRISPR in Agriculture: An Era of Food Evolution

CRISPR gene editing technology has recently developed apples that don't brown when sliced, created resistance to diseases and pests that wipe out crops, helped with the global world food crisis, and more. Learn about what CRISPR foods are and when they may be coming to a store near you.

Some of the foods we know and love could be gone from the planet faster than you might think - chocolate might be gone in 40 years and oranges are under threat as well. Something must be done in the world of agriculture to prevent this, and even more seriously, to prevent mass starvation when humans reach or exceed their carrying capacity. So, what can be done?

One answer to all these dilemmas lie in genetically modified organisms (GMOs). The World Health Organization defines GMOs as organisms (i.e. animals and plants) that harbor modifications in their DNA that do not naturally occur. These modifications can address many issues the agriculture industry faces, such as diminished crop yields, by increasing longevity and survival in harsh conditions. While the definition of "naturally occurring" can differ between people, CRISPR gene editing may be thought of as a form of genetic modification.

CRISPR FOODS

The ability of CRISPR gene editing in crops has resulted in a boom in the study and production of modified foods. Experts estimate that we'll be eating CRISPR-modified foods within 5-10 years. So which foods exactly will be popping up in supermarkets in the near future? And will they be safe to consume? We'll answer this and more, telling you everything you need to know about CRISPR agriculture, including:

- 6 CRISPR crops already in the works

- 18 Other CRISPR-modified foods coming in the future
- The promise of CRISPR agriculture: Common farming challenges CRISPR is overcoming
- Genetically modified vs gene edited crops: Is there a difference?
- Democratizing CRISPR: what's regulated, and what's in store for the future?

Let's start by going over the foods that are already being tested, and are likely to be some of the first available on the market.

6 CRISPR CROPS ALREADY IN THE WORKS

1. CRISPR tomatoes: wild and groundcherry

How CRISPR is being used: To create compact plants with less sprawling bushes, larger fruits that can ripen at the same time, higher vitamin C levels, resistance to bacterial spot disease, fruits that stay attached to their stem better, resistance to salt, and more.

Timeframe: 3 years, compared to 10 with previous approaches



Improvement of domestication traits in *Physalis pruinosa* (groundcherry tomato)

What it is: A productivity improvement in the genes that control the size of the plant, the size of the tomato, how many fruits are produced, and the plant architecture.

Who's working on it: Lemmon et al.

Location: United States

Current Stage: Research complete - plant would be ready for market

Domestication of *Solanum pimpinellifolium* (wild tomato)

What it is: A 3x increase in size, 10x increase in number of plants surviving, and a 500% improvement in fruit lycopene accumulation.

Who's working on it: Zsögön et al.

Location: European Union

Current Stage: Research complete - in trial stage

Tomatoes are one of the biggest successes of CRISPR foods, as so many experiments have been done. Check out this article to learn more about gene edited tomatoes.

2. CRISPR MUSHROOMS: STOP THEM FROM BROWNING

How CRISPR is being used: To alter the white button mushroom, preventing it from browning quickly and elongating its shelf life.

Timeframe: Instant modification compared to decades of work with traditional methods



Deletion of PPO genes in Agaricus bisporus (white button mushrooms)

What it is: A small deletion targeting the polyphenol oxidase (PPO) family of genes to prevent browning. A successful knockout of one of six PPO genes reduced browning activity by 30%.

Who's working on it: Yinong Yang

Location: United States

Current Stage: Plant is ready for market and confirmed unregulated by the USDA - awaiting FDA approval

3. CRISPR RICE: IMPROVING THE YIELD

How CRISPR is being used: To improve crop yields in rice, a staple food for a significant number of the world's population, yet one that is overly susceptible to negative environmental factors.

Timeframe: Modification of multiple genes at one time compared to decades of work with traditional methods

Mutations in a subfamily of abscisic acid receptors in rice

What it is: Mutations in a family of genes involved in sensing abscisic acid, a phytochrome that affects plant growth and stress responses. A subset of mutations in specific groups of genes resulted in a 25-31% increased grain yield in 2 tests performed in Shanghai & Hainan Island, China.

Who's working on it: Miao et al.

Location: China

Current Stage: Research continued on additional varieties of rice

4. CRISPR CITRUS FRUITS: SAVING THE ORANGES FROM GREENING

How CRISPR is being used: Oranges and other citrus foods are at risk from decimation due to the "citrus greening" disease. CRISPR could create a resistance to this disease, and save the industry which is at a complete risk of collapse.

Timeframe: Currently undetermined

Generating citrus varieties that are resistant to Candidatus Liberibacter bacteria

What it is: Research has already proven that CRISPR-Cas9 editing can be used to edit citrus species. Current research is using CRISPR to edit the genome of citrus, particularly oranges, and to use engineered viruses to attack *C. Liberibacter* before it can infect new crops.

Who's working on it: Nian Wang

Location: United States

Current Stage: Currently being researched

5. CRISPR CHOCOLATE: SAVING THE CACAO TREES

How CRISPR is being used: To modify the cacao plant to equip it with enhanced resistance to diseases, and ultimately to prevent eventual extinction.

Timeframe: Currently undetermined

Cacao plant modification to prevent the spread of Phytophthora tropicalis disease

What it is: CRISPR-Cas9 components



are introduced into cacao leaves to knockout the gene *TcNPR3*. Leaves with disrupted *TcNPR3* gene expression displayed increased resistance and expression of defense genes when infected with *Phytophthora tropicalis*.

Who's working on it: Fister et al.

Location: United States

Current Stage: Proof of concept achieved. Additional research being done into other parts of the cacao genome that could allow additional resistance to disease and climate change if altered with CRISPR.

6. CRISPR WHEAT: REMOVING THE GLUTEN

How CRISPR is being used: To create strands of wheat that do not contain gluten, allowing those with Celiac Disease to consume wheat varieties without immunoreactivity.

Timeframe: Success using CRISPR with simultaneous gene manipulation while no current success using breeding/GMOs

Manipulation of α -gliadin gene in wheat to reduce gluten content

What it is: An 85% reduction in immunoreactivity, and a successful mutation of 35/45 genes of the wild species of wheat to produce a transgene-free, low-gluten species of wheat.

Who's working on it: Sánchez-Léon et al.

Location: European Union

Current Stage: Research complete - in trial stage

Read full @ <https://bit.ly/4cUHTET>

Source : <https://www.synthego.com>

Question

Q&A

Answer

01

CUMIN PROCESSING UNIT

javeduk: How I start Cumin Processing Unit in Gujarat? What type of machinery required?

Answer 1: shahatul: Please feel free to discuss further.

Answer 2: garao56: Cumin is an essential spice used by human beings from time immemorial.

The peppery flavors of Cumin add to its value as a culinary spice as well as its function for helping ease digestive complaints.

The property of this flavor known as a carminative is to help dispel gas from the digestive tract.

There are some studies almost exclusively done in vitro, indicating some promise for the essential oil extract of Cumin seeds as an antibacterial agent

The processing involves 1. Cleaning for whole cumin used as spice, seed purpose etc

2. Cumin Powder

3. Cumin oil

What type processing you going to take up so that necessary machinery can be procured for setting of the processing unit .

Answer 3: regina: If you want to go for Cumin extraction plant, pl contact S Veerasamy.M.E(Chem)

02

ESSENTIAL OIL PRODUCTION

makbalar: I aspire to set up manufacturing plant of essential oils in Gujarat and supply it to Aroma, pharma and cosmetic industry in bulk. Can anyone guide me with its manufacturing and marketing process?

Answer 1: brij07: Hello Sir, I can help you with your query. I have 9+ years of experience in FMCG, Agri-Business, Food Processing Industry. I can help you not only with the manufacturing but also the complete establishment of your business. Contact me .

Answer 2: regina: Please contact .

Answer 3: dhayaagrowers: One of my client is interested in making perfumes from fiji Islands I can join him in your project

Answer 4: garao56: Please consult us for project reports

Answer 5: warsha19: I am sure I can be of a good use to you in essential oils ground.

03

MULTIPURPOSE HERBAL EXTRACTION UNIT ON AGRICULTURAL LAND

abhijeetk: Please note I need guidance on multipurpose herbal extraction unit. Processing capacity 75 kg herbal input per day (24 hrs. working) (25kg. per batch X 3

batches) Maharashtra state. thank you in advance

Answer 1: garao56: Please send what type herbal plants are processed

abhijeetk: Thank you for the response. we would like to work on Green Tea extract powder and Liquid, Neem, Tulsi, Boswellia, Ashwagandha. I am wondering if i can do a pilot plant in my agriculture land. The pilot plant would be like 25 kg per day output for Green tea as a design.

Answer 2: garao56: Extraction plant can be set up on the farm land itself. Please approach us for any project report for availing bank finance



AVOCADO PLANTATION - JANGAON/TELANGANA

04

sohansloka: I have a farm near Jangaon, Telangana, with about 15 years old 150 mango trees. I have nearly 1 acre of vacant land and am considering starting an avocado plantation. Can anyone advise if avocados are suitable for this region? Also, where can I purchase saplings, and what are the economics of cultivation? Thank you in advance for the help.

Answer 1: marutil: Hi, Swapnil here rather going with exotic Avocado plant grow indigenous plant. Which you won't find hard to sale in indian market. As now its new trend of Avocado in market and more people are planting it, but don't know how those people will sale it, Rather you can go with Banana which is to sale in indian market and consume everyday by common man and during festive season also get a good rate of it.

05

DETAILS ON KEELANELLI CULTIVATION

senthildcool: Can I have details on cultivation procedure, cost of seeds, market price per kg, production per acre, other web links etc. of keelanelli (Phyllanthus niruri) ?

Answer 1: Ashwini: Hi Phyllanthus Niruri is commonly seen in

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- Plants can be supplied one year after advance booking.
- OTHER VARIETIES AVAILABLE Gangabondam, Malaysian Dwarf

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South India. The plant is considered deobstruent, diuretic, astringent and cooling. A decoction of the plant is administered to jaundice. Phyllanthus Niruri is a tropical weed and survives under tropical and high rainfall conditions.

Cultivation Techniques : The Phyllanthus Niruri plants are propagated by seeds. The seeds are collected when the plants are matured. The whole plants is collected and allowed to dry and fruits to dehisce on paper.

The seeds are very small so they should be mixed with sand before sowing. The seeds are sown between the months of late April and late May.

For raising the seedlings, seeds have to be sown in nursery beds. The soil is dug up to a depth of 30cm mixed with 1kg/m of dry cow dung and sand. The bed should be watered 2 times daily for 15 days. So that all weeds will germinate by the end of 15 days. Remove the weeds from beds by loosened by light digging.

Soil drenching with fungicides such as "CAPTAN" can control harmful soil fungi. Usually 2% of the solution is used for seed beds.

Then the seeds are sown to the beds. The seeds germinate within 2 weeks and takes 30 to 45 days to grow. When the plants are 3 to 4 leaf stage they can be taken to main field and planted. After planting the plants to main field, give liquid manure of Cow dung (organic manure of Cow dung).

For details regarding the seeds Please contact the nearest medicinal plants department.

Answer 1: senthildcool: Thanks, and these I already had got from web. Please let me know details on nursery bed preparation etc.

Also will there be any problem if I plan to cultivate other plants after harvesting phyllanthus as it is considered to be a weed?

Answer 2: ponsanthan: Phyllanthus amarus - Keelanelli Phyllanthus is annual weed, it will grow during rainy seasons; it is also as weed in vegetable gardens, flower gardens waste lands and roadsides.

It is propagated by seeds

Seeds are having short viability, mostly one year. 6 seeds are available in a fruit.

The herb can be grown two times in a year, good sunlight is necessary for the crop.

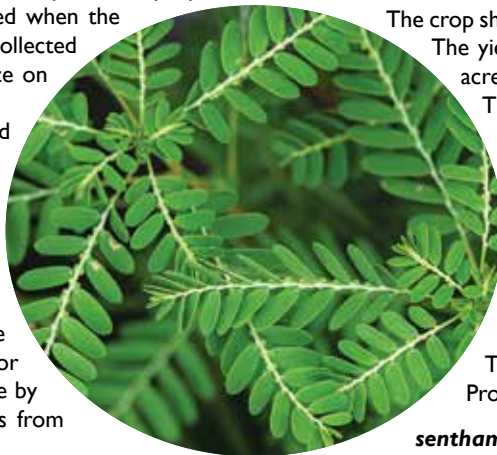
5ton organic manure and 100 kg DAP should be applied per acre. June – Aug; jan – Feb, irrigated crop will give good yield. Seeds needed per acre 500g – 1kg.

Nursery bed can be prepared and seeds can be sown there; after one month seedlings can be transplanted to main field.

Weeding is done after 15 – 20 days of transplanting.

Watering is done ones in a week.

Leaf mite is common, it is difficult to control, it is not making much damage to the crop. Small moth also present in the leaves. Powder mildew is another prominent disease. When the night temperature is going below 22oC the mildew will spread. The crop should be harvested before the commencement of winter. When it is single crop It will spread very fast and the whole crop become



white. So it should be harvested in October. The chemical content also will go down during winter.

The herb can be harvested at the 60th - 90th day of transplanting, the herb will be 2 – 3 feet height, if there is delay for harvest the basal leave start falling.

The crop should be harvested during October or April.

The yield will be 1.5 to 2 ton of dried herb per acre.

The herb should be cut 4 inch above the ground level and chopped into 15 -20cm long pieces and dried in sun light / shade. While drying, separate the mature seeds that are falling down, dry the herb for 3-5 days and then pack. Dry the seeds and preserve it for next use.

The current market price is Rs. 45 / kg dried herb

The expenses will be 12- 15000/ per acre.

Profit expected is 40- 50,000/acre in 4 months

senthamil: Hi Sir, We are in Tamilnadu and having 15 acres of own land like sandy and sandy loam soil with good water facility. Kilanelli cultivation is suitable for our land or?

Answer 3: garao56: Sandy loam is best suitable for Phyllanthus Amaus. Abundantly grown in field bunds, coconut orchards and pathways, roadsides in Godavari Delta areas.

The plant is widely used to tone-up sluggish liver and also given in chronic liver condition and jaundice. In Unani medicine, the plant is used in jaundice as deobstruent, diuretic, cooling and astringent. In recent studies, the herb and its root have exhibited antiviral actions on Hepatitis-B. G.Anandarao B.Sc(Ag)

TREE PLANTING IN AGRI LAND

zxkavi: I am planning to cultivate trees in my agri land. Can you please suggest the trees, and water source for this.

Current situation are:

Dry land - no water source available



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Question

Q&A

Answer

There is a bore-well with 1200 feet, but no water available.

Answer 1: surya2017: Try Medicinal Plants like Ashwaganda - Govt will give subsidy on seed also

Answer 2: garao56: Dear Sir, Please take up casurina which is drought resistant tree which survives on rain fall but initial plantation time /summer months watering must be done by transporting water through water tank, manually. If not possible , please take up Eucalyptus or Subabul which are suitable but growth depends upon rain fall , now a days marketing is a problem as there is no demand for pulp wood from paper factories.

Please contact us for further guidance.
G.Anandarao B.Sc(Ag)



BEGINNER IN FARMING

nandhaa80: Hi.. I would like to start a small size farming which is to be maintained less like herbal and forest type farming. Because I'm working in a corporate company at Chennai and don't want to quit the job. It is for making money and as well as saving nature, environment and also to contribute something to the earth/society. Suggestions are welcome.

Answer 1: garao56: Dear Sir, Farm Forestry and medicinal herbs can be taken up without quitting the job. Please inform the extent of land you are owing and location.

For example Managium (Australian Teak - come to maturity 15 Years) with Asparagus (medicinal roots and Filler plant for flower decoration) can be taken up. There are other important medicinal herbs such as Safed Masli and Stevia etc provided your farm must be organic certified.

For making organically certified land you are required to keep one labour family on the farm with 2 to 4 cows (Gir cows fetch more income as the milk is highly demanded and calves, bulls and cows are much sought by farmers every where) to maintain a biogas plant and also vermi compost unit thus gradually you can make your farm organic within 3 years. Then your products are eligible for export to other countries as European citizens are products raised with In-organic fertilizers and chemical pesticides.

Please consult us for further guidance. G.Anandarao B.Sc(Ag)

Answer 2: amrafarms: its important that you understand this method of farming is slow, Cost effective but not labour intensive. Multi Layered farming can be adopted to earn better with minimal maintenance. Labour is required at the farm, and most likely full time. Depending on the acreage of your farm. the labour required will vary. Your First job would be to get your soil testing done. You will have a clear idea of what will grow in your land. There are a few crops which you can

straight away discard, like coconut, which is water intensive and also not suitable for chennai area. But you have a range of options from Mango, Guava, Pomegranate, chikoo and a lot more which can be planted. Papaya is also a wonderful crop and very profitable Start by planting tree varieties first. Well spaced trees will take 3-4 years before they make any profit. the space in between can be used for a range of mid sized crops. Papaya, Pomegranate and bananas are good options to consider. And then you can pick vegetables in the remaining area followed by root crops like elephant yam. By the end of the first year, you would be able to collect on the yam. Cash crops like vegetables will provide running cost in a few months. Bananas and Papays will give you revenue after a year and by the 3rd year you will have enough revenue from the orchards.

A cow is mandatory but dont look at it as a means of income. Think of it as a factory which produces manure for your farm. If you can maintain chickens and goats, it would do a good job in controlling weed but you will have to be careful that the plants are not chewed by the goat.

The options are unlimited. Work will never end. Farming may seem like a part time job... but trust me... it never is

Answer 3: garao56: Dear Sri Nandhakumar, Please go for hybrid coconut , DJ Farm variety , which will start yielding from 2.5 years and continue up to 50 years . The minimum income on one acre orchard will be around Rs.1.50 lakh per annum. As our friend suggested you can take multilayered crops like cocoa, citrus , arecanut and banana etc. if sufficient irrigation water is available on the farm. If coconut is taken up on more 5.00 acres (say 5.50 acres) National Horticulture Board will give 40% subsidy on the investment made for establishment of the unit.

Please contact us for project reports. G.Anandarao B.Sc(Ag)

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 Fine grain



Duration : 120-125 days
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Duration : 120-125 days
 Superfine grain



Duration : 120-125 days
 Fine grain



Duration : 125-130 days
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