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# AGRICULTURE The National Agriculture Magazine TODAY

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## CROP PROTECTION

**Protecting Crops, Protecting Food Security**

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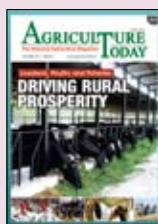
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**From the Editor's Desk****NEW SOLUTIONS NEEDED IN CROP PROTECTION PROGRAMME**

About 15-25% of crop produced is lost due to pests, weeds and diseases. Crop protection has therefore become an important management strategy in agriculture worldwide. While chemical control options are considered absolute, most of the crop protection strategies have been centered on combination of all the available strategies in an integrated manner.

Crop protection chemicals are still the most extensively adopted management measure once the pest problem is reported. India is the fourth largest global producer of agrochemicals. The Indian crop protection market is dominated by Insecticides. However, fungicides and herbicides are the largest growing segments in India owing to a shift in agriculture from cash crops to fruits and vegetables and government support for exports of fruits and vegetables. Labour shortage, rising labour costs and growth in GM crops have led to growth in the use of herbicides. But in general, the per hectare consumption of pesticides in India is amongst the lowest in the world. With an increasing thrust on improving crop productivity and reducing crop losses, India is a fertile market for crop protection chemicals. India is slowly emerging as an important exporter of pesticides. With an increasing thrust on improving crop productivity and reducing crop losses, India is a fertile market for crop protection chemicals. India is slowly emerging as an important exporter of pesticides. However, there is a significant share of spurious pesticides available in the market. These inferior formulations result in by-products which may significantly harm the soil and environment. Apart from crop loss and damage to soil fertility, use of non-genuine products leads to loss of revenue to farmers, agrochemical companies and government. There is a lack of awareness amongst the farmers and this makes it immensely difficult for them to differentiate between genuine and non-genuine products.

Excessive and indiscriminate use of pesticides with scant regard to their toxicity has led to a deluge of instances of pesticide contamination, poisoning and pesticide residue in agricultural products. Biological control which employs nature's defenses against diseases and pests as biopesticides or Biocontrol agents, is one of the alternatives that has been employed in agriculture. However, the transition from chemical to biocontrol may not be a smooth one considering many challenges spread out for the bio pesticide commercialization. Many bio pesticides have high levels of selectivity. Also, adopters of bio pesticides face large fixed costs of adoption that will only decrease once the technology is used more widely.

The genetically engineered crop varieties offer a promising direction as it combines the qualities of pesticides without polluting the immediate environment with harmful chemicals. But the lack of confidence in the genetically manipulated technologies and the lingering doubts about the crossover of these 'foreign' genes to local varieties has marred the prospects of this technology. There is considerable resistance in introducing the technology to food crops.

Each day is a new challenge to agriculture. To be able to overcome this challenge new technologies must be rapidly adopted and assimilated into the crop production system.

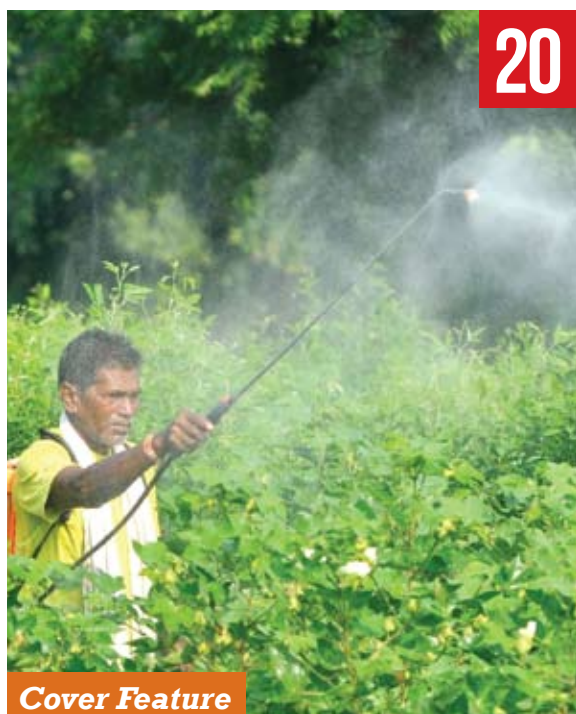


*Anjana*  
**Anjana Nair**



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# Kill Cyperus from Nuts, Less Pain, More Gain

Higher Yield



Kill Cyperus  
from nuts



Save Labour,  
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## **Increasing Temperatures and Dwindling Vegetables**

*A recent report has warned of a possible shortfall in global vegetable production on account of global warming*

**T**he world would be seeing a lot less vegetables in a few years from now. The prediction is based on a report published in the Proceedings of the National Academy of Sciences that has warned that continuously rising temperatures may combine with the water shortage to cut vegetable yields. This is in contrast to earlier claims of a likely increase in crop yields due to rise in carbon dioxide. But the current review found that any such boost would be cancelled out by higher greenhouse gases, reduced water availability for irrigation and rising temperatures.

The report said that if in 2100, the current trajectory of global warming is continued, the global vegetable produce will be reduced by 31.5%. The study mentioned crops like soy and lentils, stating that the global produce of these crops may drastically fall, due to increases in temperatures and a shortage of water for agriculture. The direct effect of this fall in the vegetable produce will be reflected on our diets, as the human race would be deprived of natural sources of healthy nutrients, vitamins and minerals. So we are not only looking at a possible threat to food security but also on human health.

India is the second largest producer of vegetables. Vegetables, in general, are sensitive to environmental extremities, and thus high temperatures and limited soil moisture would naturally result in low yields. Climate change affects water storage and availability of water for irrigation, if there is a reduction in the availability of rainfall. Also, climate change will be the most important cause of biodiversity loss and this aspect is crucial in vegetable production as insects are important pollinating agents in vegetables. Changes in species distributions, phenology and ecological interactions may thus affect yield. In addition to the physiological and biochemical changes, climate change influences the pest and disease incidence. The differences in the environmental parameters will not only affect

yield but also the quality of the yield not only the aesthetic value but also the nutrient content.

Climate change and its effects have been studied and documented for some years now. All the possible outcomes due to increased global temperatures have been proposed. Inundation, salinity, water logging, increased temperatures, new pest and disease outbreak etc. could be the possible scenarios in the event of climate change. So developing varieties that can survive in these hostile situations without any reduction in the yield can safeguard the agricultural production to some extent. Many varieties resistant to salinity and waterlogging to many crops have been developed. Such varietal development programmes must be initiated in vulnerable crops and regions. Models could be generated predicting the pest and disease outcome under changed circumstances and hence suitable management measures need to be developed to face the situation.

Water scarcity would be another major threat that world in general, and India in particular, would be facing. The conventional method of irrigation must be replaced by technologies that are not only judicious but also economical. Fortunately, India has been investing, policy wise and technology wise in this area. Micro irrigation has received immense support and encouragements from the government through many programmes. This kind of irrigation needs to be expanded to agriculturally significant areas to maximize production and minimize water consumption.

India should view this report seriously, as we are not only a populous country but also an important agricultural producer. A business as usual approach would be detrimental for the integrity and food security of the country. India's strength lies in its productive work force. With lessened agricultural production we would be depriving nutritious and economical food source for a population. India must take concrete action towards addressing this issue before it blows up into monumental proportions. We have to initiate action when we can.



## Sugar Sector Turns Sour

*The current bailout package is hardly a succor to the sugarcane farmers*

India's sugar industry is passing through another lull face with sugarcane farmers staring at dues of Rs 22,000 crore. Apparently, overproduction in the current season has led to a fall in price and consequent dues. The government's announcement of a Rs 7,000-crore bailout package attempts to restore some stability in the segment, has however been unable to excite the farmers.

Considered too little, the package addresses only 5 per cent of the total dues to be credited directly into the accounts of farmers via the creation of a buffer stock of 30 lakh metric tonnes of sugar. Only Rs 1,175 crores will be allocated to pay the pending dues of sugarcane farmers. The rest, worth Rs 5,732 crore, is aimed towards providing financial assistance to sugar mills in order to augment capacity by investing in infrastructure, a move that has limited potential to address the current issue of mounting arrears. The reimbursement will be made on a quarterly basis on behalf of the sugar mills against pending cane dues.

The current package has focused on improving the status of sugar mills. Sugar mills which are also passing through a worst crisis would receive a credit to the tune of Rs 4,400 crore and interest subvention up to a maximum of Rs 1,332 crore to upgrade existing distilleries attached to sugar mills. The credit will be in the form of soft loans to ensure more sugarcane is diverted for producing ethanol which could be blended with petrol. The Rs. 4,440 crore to sugar mills is meant for augmenting their ethanol production capacity. This would help diversion of sugar to ethanol production during surplus years to reduce excess inventories. These steps could address some of the long standing concerns felt by the sugar industry, but it miserably fails to bail out the mills from the current predicament. Another cabinet

decision was raising the Minimum Selling Price of cane from Rs. 26 per Kilogram to Rs. 29 per Kilogram. Even the new hike is no way near to the actual cost of production of sugar which is calculated to be Rs. 36 per kilogram, according to the industry estimates.

Besides these new steps, the Government had in the last few months announced several other measures to improve the liquidity position of sugar mills. These included doubling the Customs duty on imported sugar to 100 per cent from the earlier 50 per cent, besides announcing export quota for sugar mills to export a total of 2 mt during the current marketing season. It also withdrew the Customs duty on sugar exports and re-introduced Duty Free Import Authorisation Scheme which would help facilitate and incentivise export of surplus sugar by sugar mills.

The government's package has focused heavily on long-term investments in sugar industry, the benefits of which will not accrue to sugarcane farmers who are facing a crisis in the present. Of the Rs 22,000 crore owed to sugarcane farmers in the country, sugar mills in Uttar Pradesh alone owe Rs 13,000 crore. Sugar mills in UP have not paid 37% of the amount owed to sugarcane farmers.

The current crisis in sugar sector was the result of an excess production of sugarcane. India's estimated annual consumption of sugar is 25 million tonnes falls way short of the production in 2017-18 which touched 31.6 million tonnes. The trend is expected to continue in the next production year also which means a repeat of what happened this year. The arrears would thus be not only carried forward to the next year but will be aggravated with the dues of the next year. The problem would be much worse next year, until and unless government evolves a suitable strategy to address the liquidity problem.

## Farmer Power

*The 'Gaon Bandh' brought villages to a standstill and Urban centers quiver*

**O**n the anniversary of the Manadsaur killing, India saw another major farmer uprising, 'Gaon Bandh' encompassing 22 states. The village shut down saw cultivators deserting markets in urban areas and truckloads of vegetables and milk being emptied on the streets. Cost of perishables soared and India once again shriveled under the might of farmers.

It is not the first time that farmers have raised their cudgels against the system. The demands that were laid down by the farmers were the same, each time. Only their resolve had tightened. Waiving the entire loans of farmers, pension to farmers older than 55 years and Minimum Support Price (MSP) on 65 litres of milk, fruits and vegetables were the demands raised this time. All of these demands have income stability as the common denominator. Ever since the submission of report by National Commission on farmers headed by M.S. Swaminathan, the implementation of the same has been a persistent demand by the farmers. The key recommendation was that the minimum support price (MSP) be set at cost plus 50% of the cost. However, even the recent budget also steered clear from the implementation of Swaminathan report and continued with their previous formula. Even the current MSP structure is in shambles. The delay in payments, lack of infrastructure at procurement centres, distance to procurement centres and delayed announcement of MSP rates have all affected the effectiveness of the MSP regime. Loan waiver is another persistent demand by the farmers. Political parties have consistently used them as instruments to lure the vote bank and this has been ingrained as a permanent feature in the farming system of India. Although loan waivers seldom solve credit deficiencies of the farmers, they have created the impression that they are the only solution to farmers' distress.

Another dimension to this protest was the impact they had on the urban centers. The agitation has affected not only the availability of these perishables but also a steep increase in their prices has been witnessed. The agitation has reportedly caused vegetable prices to spike by 10-15 per cent in a handful of cities in North India, Maharashtra and Madhya Pradesh - jumping 20-30 per cent in certain pockets in Jaipur and Indore. Despite the consumer woes, farmers have also incurred heavy losses especially the dairy farmers. This has spurred unrest among farmers and clashes have been reported at many places between farmers and traders. E-commerce portals such as BigBasket and Grofers, the new face of agriculture marketing has also come under stress. Restaurants and casual dining also faced the pinch with the hike in prices being transferred to the customers.

The recent farmer agitations are signs of a deeper malaise existing in Indian agriculture. Ours which was mostly a production oriented system had rarely treated agriculture as an income generator of a large section of the population. The advances that India today boasts of may have made the country an agriculture super power but it did little to help the living conditions of the farmers. Farmers are the food producers, which is the most important job on earth. Their importance should not be undermined. Agriculture should shift from being a mere food producing system to a system that benefits its producers as well. The welfare of the farmers are paramount to the welfare of the food producing system in the country. Most of the schemes today that finds resonance among the farmers are the ones which have got a political undertone to it. Loan waivers, free power etc. have deprived the sector from some real benefits. Agriculture should not be viewed as a political instrument. All the political parties should accede to this. After all the progress of the nation lie in the hands of a farmer.

## Rethreading the Rubber Industry

*India in urgent need of a National Rubber Policy*

Indian Natural rubber sector, once a money spinning segment has lost its sheen and competitiveness. The over-dependence on imported, cheap natural rubber and declining domestic production have retarded the growth prospects of India's natural rubber segment.

A recent study by Rubber Research Institute of India has clearly warned that the unabated cheaper imports of natural rubber may be highly unsustainable, posing serious challenges for growth and competitiveness of India's rubber sector. The industry has been losing its momentum and its contributions to the economy are on the decline in recent years. Despite the presence of a robust rubber segment, India has been depending on the rubber imports owing to cheaper prices existing in the international market. Natural rubber production-consumption gap estimated for the current fiscal touches a historic high of 4.7 lakh tonnes as per the Rubber Board data.

Natural rubber has a dominant market in the rubber industry, as it constitutes 66 per cent of the total amount of rubber the industry consumes. However, domestic rubber production has been on the decline, in recent years, due to non-remunerative prices in the market. Rubber, a perennial crop, has been left standing by the growers in the plantation as they refrain from tapping the trees. Apparently, the expenses incurred in paying the tapping charges and processing the latex into sheets have become uneconomical. Nonetheless, rubber consumption and the industry continues to grow, albeit at lower rates, with substantial imports. While in India natural rubber is being traded at Rs 122 per kg, globally it's hovering around Rs 118 per kg. With prices of natural rubber in the global market staying lower than the Indian prices, imports have been on the rise. Also, the demand for natural rubber has been on the rise – consumption has crossed 1 million tonnes – over the last few

years with fairly decent economic growth rate and higher economic activities.

The government cannot continue a lackluster approach towards the sector considering the contribution of the sector towards the economy. Indian rubber industry is too important for the economy to be left to the uncertainties and vagaries of supply issues in the global market for long. With a value of output close to Rs. 750 billion per annum, the Indian rubber industry is a major contributor to the country's manufacturing GDP and national economy. Export of rubber products earns close to US\$ 2.5 billion a year. The longer the decline in domestic production continues, the more difficult it will be to reverse the trend because of the perennial nature of the crop. The government should introduce measures that could woo the growers back to their plantations especially when indicators point towards a resurrection in the natural rubber demand. With the global GDP growing at 3.8 per cent, it is expected that the international demand for natural rubber would pick up further and raise prices. Also, efforts of the East Asian countries (Thailand, Indonesia and Malaysia) to limit exports (initiated earlier this year) can further boost the global prices.

For the rubber growers to stay in business, the Centre has to put some restrictions on imports to ensure steady domestic prices for the commodity. From the agronomic point of view, the rubber plantations should also introduce perennial inter-crops like cocoa and coffee that can be cultivated in mature rubber plantations which would be a great relief to rubber farmers during periods of low rubber price. The study advocates diversification of activities of the Rubber Producers' Societies (RPSs) to qualify them as complete farm service providers.

India needs to seriously rework the policies and work towards assimilating the varied interests of the stakeholders. There is a need to put in place a proper National Policy on Rubber which can address these conflicting issues.





## Menterra invests an undisclosed amount in FarmFolks Private Ltd

➤ Menterra Social Impact Fund, an impact focused venture capital fund, has announced a new investment in FarmFolks. Artha Venture Challenge, an impact investment initiative of the Singh Family Foundation, has co-invested alongside Menterra. The Bengaluru-based company is led by Lakshmi Priyan V G, a veteran in the Fruit & Vegetable space. FarmFolks targets two major problems in the agri space - addressing supply chain inefficiencies and information asymmetry to provide fair and consistent market access for small farmers. The company is committed to delivering fresh, high quality produce to end consumers. FarmFolks currently procures 900 MT of Fruits and Vegetables per month from its associate farmers and delivers it to consumers by partnering with institutions and retailers like Tesco's Star Bazaar, Big Basket, Namdhari Fresh, Nature Basket, Grofers and Aditya Birla's MORE. Menterra funding will be used to invest in infrastructure and expand reach to cover additional products and geographies.

## AgroStar, IBM arm to aid agribusiness

➤ AgroStar, an agritech start-up, said it has collaborated with The Weather Company as it aims to transform the agribusiness for farmers in rural India. It would be using hyperlocal weather forecast data and insights from The Weather Company, an IBM business, to help farmers make informed decisions for better crop output. The firm said the collaboration would enable the two companies to provide critical insights into crop disease risks. It would also provide the probability of occurrence of a particular pest or disease with high levels of accuracy in crops like cotton and chilli. These insights, delivered to the farmer through AgroStar's voice and digital platform, has the potential to increase crop yield and reduce crop damage, the company said. "We are very excited to deliver at scale, near-precision agriculture practices to small and marginal farmers," said Shardul Sheth, co-founder, AgroStar. AgroStar said it had acquired a large and accurate database of farmer profiles. These inputs are combined with The Weather Company's disease and pest forecast algorithms to equip farmers with the information they need for effective management at every stage of the crop.

## NACL in pact with ATGC Biotech

➤ NACL Industries Limited, formerly known as Nagarjuna Agrichem Limited, has entered into a memorandum of understanding with ATGC Biotech Private Limited for a joint venture in plant protection business. ATGC is a pheromone chemical synthesis company located in Hyderabad. The growing crop protection business in India has thrown up opportunities for new modes of controlling insects and other pests without having residuary effects on the crop, an NACL press release said on Tuesday. With resistance to the GMO (genetically modified organisms) crops impacting the agricultural sector, mating disruption technology is the future for sustainable pest control, it said.



## Adanis emerge highest bidder for Ruchi Soya with Rs 6,000 crore offer

❖ Billionaire Gautam Adani's group company offered about Rs 6,000 crore to emerge as the highest bidder for acquisition of bankruptcy-hit edible oil firm Ruchi Soya, sources with direct knowledge of the matter said. Baba Ramdev-promoted Patanjali Ayurved, the only other qualified player in the race, has bid for around Rs 5,700 crore, they added. However, Patanjali will have a right to match the offer under an auction being done under so called Swiss challenge method. The Committee of Creditors (CoC) of Ruchi Soya, in its meeting opened the bids submitted by the two contenders — Patanjali group and Adani Wilmar, which sells cooking oil under the Fortune brand. The CoC has decided to conduct Swiss challenge method to maximise the asset value of Ruchi Soya.

## Bayer makes open offer to buy 26% in Monsanto at Rs 2,927 a share



❖ Bayer AG, the chemicals and pharmaceutical company, has made an open offer to acquire 26 per cent additional stake in Monsanto India. Bayer AG, along with its Indian arm Bayer CropScience, has proposed to buy up to 44,88,315 shares worth Rs 1,300 crore of Monsanto India, said the company in a statement. Bayer Group has fixed the open offer price at Rs 2,926.87 per share and the maximum size of the open offer will be for Rs 1,314 crore, it added. The open offer will start on July 27. The open offer was triggered as Bayer group completed the \$63-billion deal to acquire Monsanto on June 7. As part of the global deal, Bayer Group indirectly acquired 72.14 per cent stake in Monsanto India. Both the listed Indian units, Bayer CropScience and Monsanto India, will continue to operate independently for the time being, said Bayer in a statement earlier. The deal was initially announced in September 2016 and was completed after receiving all necessary regulatory approvals from various countries, including the US and India. Bayer Group is present in India since 1896 and has presence in crop science and pharmaceutical. Over a period of time, Germany's Bayer AG plans retire the 117-year-old US seeds maker name.

## Deepak Fertilisers announces Q4 and annual results

❖ Deepak Fertilisers and Petrochemicals Corporation Ltd (DFPCL) announced its financial results for the quarter ended March 31, 2018 (04FY18). On a standalone basis, total income of the Company for the quarter grew by 89% from Rs. 619.77 Crores in 04 FY 17 to Rs. 1,174.40 crores in 04 FY 18. PBT recorded a growth of 29% from Rs. 38.74 Crores in 04 FY 17 to Rs. 49.95 crores in 04 FY 18, while PAT recorded a growth of 112% from Rs. 25.54 Crores in 04 FY17 to Rs. 54.07 crores in 04 FY18. On consolidated basis, the total income of the Company grew by 53%, from Rs. 1,256.27 crores in 04 FY17 to Rs. 1,916.33 crores in 04 FY18 driven by increase in TAN and solvent trading volumes. PBT stood at Rs. 43.38 crores in 04 FY18 as compared to Rs. 70.54 crores in 04 FY17 and PAT stood at Rs. 38.98 crores in 04 FY18 as compared to Rs. 32.46 crores in 04 FY17. Higher raw material cost in 04 FY18, especially ammonia and natural gas, which increased by 32% and 25% respectively on YoY basis, impacted the profitability. Chemicals segment reported revenues of Rs. 1,454.11 crores in 04 FY18 as compared to Rs. 903.05 crores in 04 FY17, and segment profit stood at Rs. 140.26 crores in 04 FY18 as compared to Rs. 111.43 crores in 04 FY17. To strengthen its position as the most preferred supplier of solvents to the pharma sector, the Company continued trading activities, which contributed positively to the topline growth of the segment. All the manufactured products in Chemical segment reported growth in volumes during the current quarter. Continuing from the previous quarter, Technical Ammonium Nitrate continued to operate on higher capacity utilization based on improved demand. Reaffirmation of Anti-Dumping Duty for the next five years is encouraging and will further strengthen the outlook of TAN business. Fertilizer segment reported revenues of Rs. 445.92 crores in 04 FY18 as compared to Rs. 342.27 crores in 04 FY17. Sudden price increase of Phosphoric Acid prices, which was not passed through to trade during the quarter impacted overall segment profitability. Segment reported a loss of Rs. 18.26 crores in 04 FY18 as compared to profit of Rs. 11.85 crores 04 FY17. As the new NPK plant stabilizes and capacity utilization is increasing, the Company will be able to replace traded products with better margin manufactured products.



**DEEPAK FERTILISERS  
AND PETROCHEMICALS  
CORPORATION LIMITED**







## 'No mill can sell sugar below Rs 29/kg'

► The government has notified its decision to fix the ex-factory sugar price at Rs 29 per kg as well as the monthly stock holding limit on mills as part of measures to help cash-starved industry to clear cane arrears, which have crossed Rs 22,000 crore. The food ministry notified the Sugar Price (Control) Order, 2018 to empower itself to fix the minimum selling price of the sweetener. While fixing the price, the Centre will take into consideration the Fair and Remunerative Price (FRP) of sugarcane, conversion cost to produce sugar and realisation of profit from bye-products. This order empowers the government to inspect records, enter and conduct searches in factories, and seizure of stocks. A separate notification was issued to fix Rs 29 per kg as the current selling price. "No producer of sugar shall sell or agree to sell or otherwise dispose of or deliver or agree to deliver white or refined sugar in the domestic market or remove white or refined sugar from the godowns of the factory in which it is produced for sale in the domestic market at a rate below Rs 29 per kg till further orders," the notification said. The ministry also issued an order directing the quantity of white/refined sugar stock that every producer of sugar shall hold at the end of June 2018.

## Govt clears three-year action plan (17-20) for agricultural education

► The Cabinet approved the continuation of the Three Year Action Plan (2017-2020) of the scheme for Agricultural Education Division and ICAR Institutes with an outlay of Rs 2,225.46 crore for strengthening and developing higher agricultural education in India. The fund will be used for strengthening agri-education being imparted by various institutes under the Indian Council of Agricultural Research (ICAR), National Academy of Agricultural Research Management (NAARM), Central Institute of Women in Agriculture (CIWA), including All India Coordinated Research Project on Home Science (AICRP-HS). "The Cabinet has approved the continuation of the Three Year Action Plan (2017-2020) of the scheme for Agricultural Education Division and ICAR Institutes with an outlay of Rs 2,225.46 crore," Interim Finance Minister Piyush Goyal said after the meeting. In a statement, the government said the purpose of the scheme was to generate quality human resources besides taking initiatives to attract talented students, address faculty shortage, international ranking, alumni involvement, promoting innovations, reduce inbreeding, academia interface, and technology enabled learning, among others. The scheme was also aimed at modernisation of infrastructure and capacity building of both faculty and students in cutting edge areas through niche area. The ICAR undertakes planning, development, coordination and quality assurance in higher agricultural education through partnership with 75 Agricultural Universities established across the country. The human resource developed by agri-varieties has played a pivotal role in transforming agricultural scenario to achieve self-sufficiency. NAARM (National Academy of Agricultural Research Management) has played a key role in enhancing the capacities of individuals and institutions of National Agricultural Research and Education System (NARES) in agricultural research, education and technology management. The Central Institute for Women in Agriculture has been providing a leadership role in empowering farm women as in the changing agricultural scenario the roles and responsibilities of women in agriculture are indispensable.



## Centre OKs Rs 2,225cr agri learning plan till 2020

► The Centre approved continuation of the three-year action plan (2017-2020) to strengthen higher agricultural education with an outlay of Rs 2,225 crore. The fund will be used to strengthen institutes under Indian Council of Agricultural Research, National Academy of Agricultural Research Management and Central Institute of Women in Agriculture.



## Centre approves Kaleshwaram lift irrigation project

➤ In a big shot in the arm for Telangana State, the Centre has given final clearance to the massive Kaleshwaram lift irrigation project, the biggest in the country. The project was estimated to cost Rs 80,000 crore, officials said. Another unique feature of the project is the longest tunnel in Asia of 81 kms between Yellampally and Mallannasagar dams. At a meeting of Central Water Commission on Wednesday all obstacles in the way of the project were cleared as the technical advisory committee of the Water Resources department granted the forest, environmental and all other clearances. Chief Minister K Chandrasekhar Rao and the irrigation Minister T Harish Rao expressed their immense happiness over the development and thanked the water resources Minister Nitin Gadkari. In a record of sorts the Kaleshwaram project, across river Godavari has secured all the necessary clearances in the shortest period of time. State Government officials said that the project secured the first and second phase forest clearances and crucial Hydrology clearance and now the centre has given the environmental clearance. Officials said that Kaleshwaram was the only project to secure the environmental clearance within a year. Officials said that this will go a long way in the expeditious completion of the project with many unique features. The biggest lift irrigation project in the country envisages to store 148 tmcft of water and utilize 180 tmcft of flood water by lifting two tmcft every day during the 90 flood days. The project will irrigate 18.47 lakh acres of land in the north Telangana districts of Karimnagar, Nizamabad, Warangal, Medak, Nalgonda and Ranga Reddy district.

## Fortified rice likely through PDS: Paswan

➤ Union Food Minister Ram Vilas Paswan announced that his Ministry was mulling over a proposal to distribute fortified rice through the public distribution system. He once again promised that the prices of grains supplied through the PDS would not be increased till June 2019, when the general elections are due. "We are planning to introduce rice fortified with essential vitamins and minerals," Mr. Paswan said.

## Govt clears Rs 8k-cr relief package for sugarcane farmers

➤ The Centre has announced Rs 8,500-crore package to boost farmers' income by creating a buffer stock for sugar, enhancing ethanol production capacity and fixing a minimum selling price to cut mill losses. The bailout is an attempt to ensure that cash-starved mills clear cane dues of Rs 22,000 crore. The sugarcane industry has been witnessing a steep fall in prices following a record sugar production of over 31.6 million tonnes in 2017-18. To relieve farm distress, the Government also decided to increase Minimum Support Price (MSP) of sugarcane crop to Rs 29 a kg. The Cabinet, headed by Prime Minister Narendra Modi, approved Rs 4,440 crore soft loan for building ethanol production capacity to absorb the cane and a buffer stock of 3 million tonnes, besides for the first time fixing Rs 29 per kg as the minimum price below which mills cannot sell sweetener. These decisions are aimed at helping mills in clearing part of over Rs 22,000-crore arrears to cane farmers, said Union Minister Ram Vilas Paswan, detailing the Cabinet decision. Sugar mills are incurring losses as prices have fallen below production cost on account of record output of 31.5 million tonnes in the 2017-18 season ending September as against the annual domestic demand of 25 million tonnes.



## Centre hikes import duty on crude, refined soft edible oils

➤ The Centre has increased the import duty on crude and refined soft edible oils such as soy oil, sunflower oil and rapeseed. Duty on crude soft edible oils has been hiked to 35 per cent and on soft oils to 45 per cent. Earlier, crude soy oil attracted an import duty of 30 per cent, and sunflower and rapeseed 25 per cent. Refined variants of all these three edible oils attracted 35 per cent. The latest duty hike, coinciding with the start of the kharif sowing season, is aimed at curbing cheaper imports. This, in turn, could translate into better prices for the farmers. The Solvent Extractors Association's efforts have yielded results, said B V Mehta, Executive Director of the apex trade body of the edible oil industry. The government has however, kept the import duty on crude and refined palm oils unchanged. On March 1, 2018, Centre had increased import duty on Crude Palm Oil, RBD Palmolein and RBD Palm Oil. As a result, import duty on CPO increased to 44 per cent from 30 per cent (effective duty 48.4 per cent) and RBD Palmolein and Refined Palm Oil to 54 per cent (40 per cent), (effective duty 59.4 per cent). The duty hike led to a slowdown in palm oil imports in May, while the inflow of sunflower and soybean oils increased. Data compiled by the Solvent Extractors Association of India (SEA) revealed that palm oil (including RBD Palmolein, CPO and CPKO) imports during May 2018 stood at 4.96 lakh tonnes (lt), as against 7.78 lt in April 2018, a decline of 36 per cent.

## Telangana walks the talk on new per-acre subsidy scheme

➤ The K Chandrashekar Rao-led government in Telangana has issued cheques totaling around Rs 5,600 crore to 57.33 lakh land-owning farmers in the state ahead of the current kharif crop season under its flagship Rythu Bandhu agricultural subsidy scheme. “Out of the Rs 5,600 crore worth cheques that we have issued since May 10, farmers have already encashed Rs 5,400 crore,” Vakati Karuna, special officer



for the Rythu Bandhu scheme informed. Under Rythu Bandhu, farmers are given a flat Rs 4,000 per acre “investment support” before every crop season, with this amount expected to meet a major part of their expenses on inputs. “In all, we have covered 1.42 crore acres. Technically, the scheme does not discriminate between farmers based on their landholding size. However, 92% of the beneficiaries own less than five acres, while 5% have 5-10 acres and the balance 3% more than 10 acres,” Karuna said. The state government had initially compiled a list of 72 lakh beneficiaries, based on a revenue department survey conducted during October-December last year. The survey collected the address and land ownership details of all farmers, apart from their Aadhaar unique identity and mobile phone numbers. “The lack of proper land records resulted in the total number coming down to 57.33 lakh. But the records are still under rectification and more farmers will be

added to the beneficiary list later,” Karuna, also head of the state’s Land Records Purification Mission, added. The Telangana government also plans to extend the flat Rs 4,000-per acre subsidy for the rabi season, with the distribution of cheques for it to commence from November 18. All this, political observers feel, would come useful for the ruling Telangana Rashtra Samithi (TRS) next April-May, when elections for both Parliament and the State Assembly are scheduled.

## Law on contract farming in the works

➤ The Tamil Nadu Agricultural Produce Contract Farming (Promotion and Facilitation) Act, 2018 — would be enacted during 2018-19, and brought into force for the benefit of farmers and contract farming sponsors, Agriculture Minister R. Doraikkannu informed the Assembly. The new Act would be based on the Model Contract Farming Act, 2018, which the Centre had come up with, he said while tabling the policy note of his department. “The buyers can get assured supply at a predetermined price. Contract farming would also assist in creating new markets, efficiency and economies of scale, ensuring quality standards, facilitating diffusion of modern technologies, minimising transaction costs, coping with information asymmetries, price volatility and sharing of risk,” he said. The Minister said the Food Processing Policy was being formulated in line with the Draft Model Food Processing Policy developed by the Union Ministry of Food Processing Industries. The government was taking steps to create ultra and mega food parks under the Public Private Partnership (PPP) model in 10 districts including Villupuram, Salem, Cuddalore, Tiruvannamalai, Krishnagiri, Erode, Tirunelveli, Virudhunagar, Theni and Dindigul, he said.



## Uttarakhand gets sex sorted semen lab to better its bovine breeds

➤ Uttarakhand chief minister Trivendra Singh Rawat unveiled the country’s first Sexed Sorted Semen Laboratory in Rishikesh, saying the test centre will help produce high milk yielding indigenous varieties of cows and buffaloes. Rawat said the laboratory has been set up as part of the Rashtriya Gokul Mission. Sexed semen technology is about preselecting the sex of offspring by sorting or separating the X-sperms from Y-sperms. “It (Mission) aims to conserve the indigenous breeds of cows and enhance their milk productivity,” he said at the inaugural function also attended by union agriculture minister Radha Mohan Singh. Rawat clarified that the proliferation of the high yielding varieties of cows through state-of-the-art laboratory would help (the government) achieve the target of increasing farmers’ income. “We (government) are trying to make arrangements, so that by the year 2021, cows wouldn’t be seen roaming on roads but would become a source of livelihood for farmers,” he said. Rawat said some success has been achieved in increasing the milk productivity of the indigenous variety of Badri cow. “Efforts are on to increase it now,” he said.

## Bihar opts out of PM's crop plan

➤ The Bihar Government has decided to start its own crop insurance scheme for farmers, opting out of PM Narendra Modi's ambitious crop insurance scheme that was launched in 2016. After a public meeting at his residential office, CM Nitish Kumar said farmers who had taken loan were not benefitting fully from the PM's crop insurance scheme. "The Centre and the state are equally paying premium to insurance companies and a little sum is also being paid by farmers in the PM's crop insurance scheme. In spite of that, insured money to farmers is getting delayed and what they are getting is less than the premium state government is paying," he said. He said the state had decided to offer them its own crop insurance scheme wherein they wouldn't pay any premium. As per farmers' requirement, the state scheme has crafted the scheme to assist them against pre-sowing and post-harvest hazards.

## Fruits/veggies from Nashik to wing it to North-East on Maharashtra govt subsidy

➤ In a major step towards connecting with the markets in the remote corners of the country, fresh fruits and vegetables from Maharashtra will be sent by air, at subsidised freight, to the North-East region and Jammu & Kashmir. The pilot project is being introduced by the Fadnavis Government for subsidising the air freight charges for a period of up to six months. Before month-end, the first consignment of 20 tonnes of pomegranate and tomatoes from Nashik will fly to Aizawl. Probably for the first time in the country, subsidies on air freight are being provided by a State government. The flight will not return empty as local farm produce from Mizoram such as organic ginger and dragon fruits will be brought back to Maharashtra. The subsidy component that works up to Rs 64/kg will be provided by the Maharashtra government.



A senior State government officer said that if the goods are sent by rail or road to the North-East, the average cost is Rs 11 per kg and if it is sent by air then it is Rs 75. But, as a promotional scheme, the State government, through the Maharashtra State Agriculture Marketing Board, will provide the subsidy. The scheme is a part of the Atal Mahapangan Vikas Abhiyan, the flagship programme of the Cooperative Department of the Maharashtra government, under which 5,000 primary agriculture co-operatives are being strengthened. Under this programme, agriculture and horticulture products would be marketed across the country. The programme has been ideated by the Co-operative Minister Subash Deshmukh. The Minister is also the founder of Lokmangal Group, a diversified conglomerate based out of Solapur.

## Silos with 9.5 lakh MT capacity to come up

➤ With the Food Corporation of India (FCI) approving silos with 9.5 lakh MT capacity in the private-public partnership (PPP) mode for Haryana, the government wants to build three of these without involving private players. Sources said Ram Niwas, Additional Chief Secretary, Food, Civil Supplies and Consumer Affairs, had requested the Centre to allow the state to build silo godowns in Rewari, Hansi and Uchana through the Haryana Warehousing Corporation (HWC). The sources further said Ravi Kant, Union Secretary, Food and Public Distribution, would visit Chandigarh and the state was likely to get the Centre's nod in this connection that day. The state had told the Centre that its storage capacity was inadequate to meet the challenge of food procurement. This year, the state had purchased 87.34 lakh MT wheat of which 45 lakh MT had been stored in the open. The sources said the FCI had approved construction of silos with 9.5 lakh MT capacity. Of this, the FCI had started construction of silos with 3 lakh MT capacity involving private players while silos with 6.5 lakh MT capacity would be constructed in the PPP mode.

## Bumper millet production in Agomani circle

➤ In a major step towards connecting with the markets in the remote corners of the country, fresh fruits and vegetables from Maharashtra will be sent by air, at subsidised freight, to the North-East region and Jammu & Kashmir. The pilot project is being introduced by the Fadnavis Government for subsidising the air freight charges for a period of up to six months. Before month-end, the first consignment of 20 tonnes of pomegranate and tomatoes from Nashik will fly to Aizawl. Probably for the first time in the country, subsidies on air freight are being provided by a State government. The flight will not return empty as local farm produce from Mizoram such as organic ginger and dragon fruits will be brought back to Maharashtra. The subsidy component that works up to Rs 64/kg will be provided by the Maharashtra government. A senior State government officer said that if the goods are sent by rail or road to the North-East, the average cost is Rs 11 per kg and if it is sent by air then it is Rs 75. But, as a promotional scheme, the State government, through the Maharashtra State Agriculture Marketing Board, will provide the subsidy. The scheme is a part of the Atal Mahapangan Vikas Abhiyan, the flagship programme of the Cooperative Department of the Maharashtra government, under which 5,000 primary agriculture co-operatives are being strengthened. Under this programme, agriculture and horticulture products would be marketed across the country. The programme has been ideated by the Co-operative Minister Subash Deshmukh.



## Farm credit uptick brings cheer, with caution

➤ Gross bank credit (non-food) grew 10.7 per cent in April 2018, registering the third double-digit growth since December 2014. Financial Services Secretary Rajeev Kumar attributed this success to the bank recapitalisation exercise undertaken last year. However, the cheer has arrived with some caution, said experts. Agriculture, the biggest informal employer in India, housing sector, which has an impact on sectors that energise the economy, and the growth-boosting exports sector are witnessing the slowest bank credit growth, data released by the Reserve Bank of India suggests. Farm loan waivers, non-performing loans in the affordable housing segment, and the Nirav Modi scam are the reasons for slow credit growth, experts said. Credit to agriculture grew at 3.8 per cent in March 2018, the lowest growth in the last decade, and it improved marginally to 5.9 per cent in April. Credit to priority sector housing grew 1.2 per cent in April, the second slowest growth in a decade. Priority sector export credit from foreign banks contracted 53 per cent in April, again the worst the decade has seen. However, it must be noted that though growth in bank credit to various sectors might be slowing, credit growth through non-banking channels is rising, offsetting the reduction in bank credit growth, said economists. “Farm loan waivers, though necessary, create strong disincentives for banks to lend. In addition, the depressed farm prices are reducing the farmers’ ability to repay loans, which has subdued farm credit growth,” a senior government official and economist said. Farm credit growth could have been 11 per cent, if adjusted for the roughly Rs500 billion disbursed as loan waivers by eight states in 2017-18, Anil Gupta, vice-president, sector head-financial sector ratings, Icara, said in an email response.

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## New head for Nabard in Karnataka

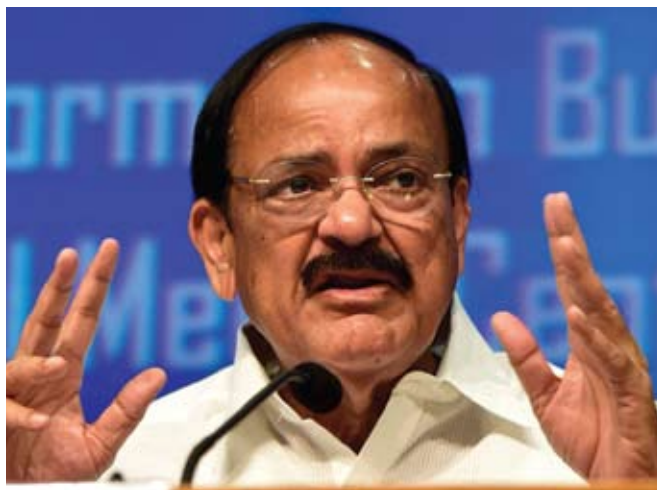


➤ PVS Suryakumar, Chief General Manager, Nabard, took charge as head of Nabard Karnataka Regional Office. Suryakumar is a post-graduate from the Indian Agricultural Research Institute, New Delhi. He is a Commonwealth Scholar and obtained his masters in Sustainable Development at the Staffordshire University in the UK. Prior to this posting, Suryakumar has worked in various capacities at Nabard across the country and headed Nabard’s New Delhi office. He has handled key national level verticals of business development and corporate communications at the head office of Nabard.

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## Loan waiver not a permanent solution for farm distress: Naidu

➤ Vice-President M Venkaiah Naidu said that loan waivers cannot be the permanent solution to alleviate farm distress. “Loan waivers are not a permanent solution. In long-term, it will affect the agriculture sector and hurt the farmers. As a huge population is dependent on agriculture for livelihood, increasing the income and the purchasing power of this group is extremely important,” he said. The Vice-President said agriculture should be made economically viable by identifying gaps in policy formulation. Policies should be pro-farmers and implementation process should be streamlined, he said. Stressing on the push to be given for allied activities, the Vice-President said activities like poultry, fisheries can help cushion farmers from the adverse effect of crop loss. The four I’s — irrigation, infrastructure, investment and insurance — for the farm sector need to be strengthened, Naidu said adding that the need of the hour is also to ensure that there is adequate transfer of technologies to the sector along with adequate marketing efforts. “Increased productivity is possible if farmers have greater access to knowledge, technology and credit,” he said.



## Credit facilities for farmers to boost agrarian economy in Himachal



➤ Extending liberal credit facilities to farmers in Himachal Pradesh, the state government is endeavoring to boost the agrarian economy. The initiative is being taken by the state government in close coordination with the banking sector to help farmers double their income by the year 2022. These efforts in Agriculture sector will boost the agrarian economy and help the farmers to double their income by the year 2022. An official spokesperson said that awareness campaign has been launched by member banks in association with Agriculture and Horticulture departments to popularize 'Kisan Credit Card' scheme. Banks have come forward to provide lending facility to farmers in a big way under this scheme to meet out their short term credit needs of crops cultivation,

he said, adding that more than 1.62 lakh farmers have availed credit facility of Rs. 3000 crore under this scheme during last year. The State Government with the help of National Bank for Agriculture and Rural Development (NABARD) has laid special emphasis on increasing the investment credit to the Agriculture sector keeping in view the importance of this sector in the state economy. District wise potential linked credit plans have been prepared according to the local potential available in the area, he added. The selection of farm linked activities has been made after wide consultation with the stakeholders. Rs. 22390 crore potential linked credit plan has been approved for the financial year 2018-19. Various banks under their financial inclusion campaign, have opened about 10.30 lakh 'PradhanMantriJandhan Accounts' and about 11.60 lakh account holders have been enrolled under 'Pradhan Mantra SurakshaBimaYojna'. More than 90 percent accounts have been seeded with Aadhar number in the state.

## Karnataka gets Rs 136 cr from Nabard warehouse fund

➤ The National Bank for Agriculture and Rural Development's (Nabard) has sanctioned Rs 136.57 crore as loan assistance to the Karnataka government under the Warehouse Infrastructure Fund. Nabard's assistance is for the construction of 103 warehouses and 163 covered auction platforms at 135 Agricultural Produce Market Committees (APMCs) in 28 districts. MI Ganagi, Nabard Chief General Manager, said, "The project will be implemented by the State's Department of



Agricultural Marketing and is expected to benefit over 160 lakh people across 12,097 villages." He added that with this, as on date, Nabard has sanctioned Rs 1,271.62 crore under the Warehouse Infrastructure Fund for construction of 340 warehouses and 269 market yards across 28 districts in the State. This includes Rs 743.56 crore to the Karnataka State Warehousing Corporation (KSWC) and Rs 528.05 crore to the Department of Agricultural Marketing. The credit assistance under the Warehouse Infrastructure Fund will help create a total storage capacity of 13.65 lakh tonnes.

## Coffee export may take 10 15% hit on poor production

☛ Coffee export is likely to fall 10-15 per cent this year, as production has been hit due to dry weather in growing regions of Karnataka. Karnataka accounts for 60 per cent of total production in the country. Coffee Board of India recently cut output estimates by 10 per cent to 316,000 tonnes for 2017-18, from the earlier estimate of 350,400 tonnes. However, the total estimated output will be higher by 1.3 per cent over last year.



According to the estimate, output of the Arabica variety is pegged at 95,000 tonnes and that of Robusta at 221,000 tonnes. "Due to dry weather conditions, production has been affected adversely, which will result in lower output. There is also lower carryover stock. These two factors are likely to pull down exports by 10-15 per cent in the current calendar year," Ramesh Rajah, president of the Coffee Exporters' Association said.

## Bangladesh slaps 28% tax on rice imports

☛ Bangladesh is imposing 28 per cent tax on rice imports to support its farmers after local production revived, Finance Minister AbulMaal Abdul Muhith informed. The duty hike would reduce imports, especially from neighbouring India, which emerged as the biggest supplier to the South Asian country last year after floods ravaged its crop. "This year we have a bumper production in rice, thus to protect local farmers, 25 per cent customs duty and 3 per cent regulatory duty has been reimposed on rice importation," Muhith said in his budget speech for the 2018-19 fiscal year. Bangladesh had cut a previous import duty of 28 per cent in two phases in 2017 to 2 per cent after domestic rice prices climbed to a record high. Bangladesh's rice imports rose to a record 3.7 million tonnes in the July-April period, data from the country's food ministry showed. "Reimposing tax on rice import was needed to curb imports. Otherwise, our farmers would have affected and could have lost interest in rice cultivation," said BadrulHasan, the head of Bangladesh's state grain buyer.

## China to boost import of cotton

☛ China is set to boost its imports of cotton by issuing additional import quotas to mills, said the China Cotton Association on Monday, a move seen by the market as another step towards meeting the demands of the top exporter the United States. The association, which lobbies the government on behalf of cotton farmers and processors, said the soon-to-be-released additional quotas were one of the measures the government was taking to help to ease recent market volatility. China, once the world's top cotton importer, has seen its imports shrink from more than 5 million tonnes in 2011/12 to around one million tonnes last year, due to its efforts to reduce state stockpiles of the fibre. Now, after several years of auctions to lower state stocks and with demand recovering, the market has become concerned about supplies.

## China allows basmati rice imports from 14 Indian mills

☛ China has allowed the import of basmati rice from 14 mills in India and is carrying out quality assessment in more mills, according to Vijay Setia, President, All India Rice Exporters Association. "China is assessing the possibility of importing basmati rice from India. They have already approved 14 mills in Punjab and Haryana for basmati exports," Setia said. However, the timeline for exports remain undefined as basmati rice is not popular in China and they mostly consume sticky rice. It will require a lot of campaigning to promote the aromatic rice in the neighbouring country, Setia said. China may also start importing non-basmati rice from India as Beijing has cleared the grain of any risk of introduction of alien pests, according to media reports. A few months ago, India pitched for market access for a variety of its goods to China in a move to bridge the widening trade deficit. India, the world's largest exporter of basmati rice, is looking at new markets to compensate for the ban imposed by the European Union. India's basmati exports to the EU came to a halt after the union reduced the permissible limit of tricyclazole residue in imported rice to 0.01 part per million from 1 part per million allowed, effective January 1.



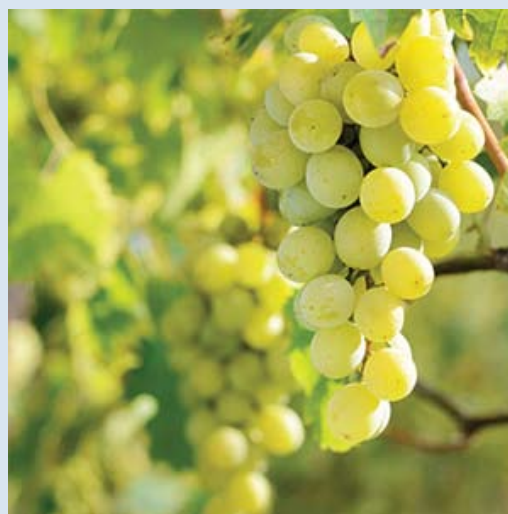


## Cashew kernel exports set to fall on declining interest from processors

➤ Cashew kernel exports from the country are likely to go down in the coming fiscal with nearly 700 processors in Kerala shutting shop due to nonviable operations, a top official of the Cashew Export Promotion Council of India (CEPCI) said. With the banks unable to offer credit to processors who are in the red for the last three years, the export of kernel in 2018-19 is likely to fall sharply, S Kannan, executive director & secretary, CEPCI said. India produces 6-7 million tonne raw cashew per annum and was till recently the leading supplier of kernels to the global markets. India exported 84,352 tonne of kernels valued at Rs 5,870.97 crore in 2017-18 as against 82,302 tonne valued at Rs 5,168.78 crore in the previous fiscal. The increase is only marginal at 2.5% in volume terms. "The marginal increase shown last year was mostly due to export obligations of the traders who availed financial grant and imported raw cashew. The obligations have expired and they have no incentive to export when the raw materials are priced high and processing is costly," he said, adding that nearly 100 processors from Kerala have gone under NPA list of the banks. The increasing cost of raw cashews imported from Western Africa and the higher processing charges in Kerala due to the relatively higher labour charges has compounded the problem. "Raw cashew prices have gone up by three times in the last few years when the kernel prices have only increased by 15% over the same period," Kannan said. The state requires around eight lakh raw cashew nuts in a year to ensure round-the-year work for the nearly 2.5 lakh workers, 90% of whom are women.

## India's exports of grape plunge 40% this year on adverse climate

➤ The country's grape exports have seen a 40% drop this year. This season grape exports touched 1,80,000 tonne as compared to 2,31,000 tonne the previous year, Grapes Exporters' Association of India (GEAI) has said. The yield this year was 40-50% less than last year. Significantly, grape exports to Europe reduced by around 9,000 tonne to 92,500 tonne from 1,07,000 tonne last year. Adverse climatic conditions were blamed for the lower export this year by industry people. According to Jagannath Khapre, president, Grape Exporters Association of India (GEAI), unseasonal hailstorm and rainfall in September badly affected the area of around 60,000 hectares under cultivation in Nashik. The figures are still being compiled but the crop was affected this season which in turn also affected grape export. However, we are happy that grape export to Europe barely dropped by around 9,000 tonne as we still await final figures, he said. Moreover the late start of the season in Europe also affected export, he pointed out. Khapre said that export data to other countries is not available but is approximately double the



exports to Europe and the UK. However, he emphasised that though exports were less than last year, comparatively they were better for farmers. Like Europe, other countries that import grapes from India, including China, Indonesia and Russia, have decided to issue stricter residue monitoring plan (RMP) norms to the country. Next year onwards, the government has decided to issue certificates to exporters to these nations as well so that exports do not face any hurdles. Last year, India exported around 15,000 tonne of grapes to Bangladesh, senior officials from the Maharashtra Horticulture Department had said earlier. Although Bangladesh has been imposing duties, this time the taxes have been raised to the tune of Rs 55 per kg and therefore grape growers and exporters have approached the Centre seeking intervention from the government to ensure that these do not rise further, Khapre said. The grapes are taken to Bangladesh by road from Kolkata by local exporters. India has been attempting to make inroads into new export markets such as China, Russia, Indonesia and Saudi Arabia. However, these countries have now decided to come up with norms for Indian grapes. Some of the norms are stricter than those set by the European Union.

## Brazil Arabica Trade Dwindles on Low Stocks

➤ Trade in arabica coffee in Brazil has slowed to a trickle as stocks dwindle at the height of the between-harvests period and merchants are still dealing with transport disruptions. The truckers strike deepened worries about hold-ups as it curbed May coffee exports by 900,000 bags.

## Sree Poshini, CTCRI develops mobile app for tuber crops

➤ Central Tuber Crops Research Institute (CTCRI) located at Sreekariyam, Thiruvananthapuram has developed 65 varieties of these different tuber crops for different agroclimatic regions of the country whose yield potentials vary with climate and soil type. During the past 15 years, scientists at CTCRI have been conducting more than 100 field demonstration trials to develop field-specific fertilizer recommendations, scientifically known as site specific nutrient management (SSNM), using a computer model known as Quantitative Evaluation of Fertility of Tropical Soils (QUEFTS). Based on detailed research work, the Institute has come out with a detailed scheme of fertilizer recommendations for these crops for different locations and yield targets, said Dr. Archana Mukherjee, Director of the Institute. Dr. G. Byju, the major inventor of the technology has now come out with a simple mobile app, Sree Poshini which is a farmer friendly tool and by using it anybody can know the quantity of fertilizers to be applied to their tuber crop based on location or climate and soil test data. CTCRI also has developed customized fertilizers for crops based on this technology and are being sold from the Institute, said Dr. G. Byju. He has also developed five different liquid formulations of micronutrients for foliar application to different tuber crops. A private company based at Madurai, M/S Linga Chemicals has already purchased the technology for Rs. 2.50 lakhs to commercially produce the five different micronutrient formulations. This is the first technology that the Institute is commercializing through Agrinnovate, a 'for profit' Company owned by Department of Agricultural Research & Education (DARE), Ministry of Agriculture, Government of India. Research studies conducted at CTCRI clearly indicated that the yield of tuber crops can be increased 20-25 percent from the current level of production if farmers follow the SSNM recommendations prescribed by CTCRI.

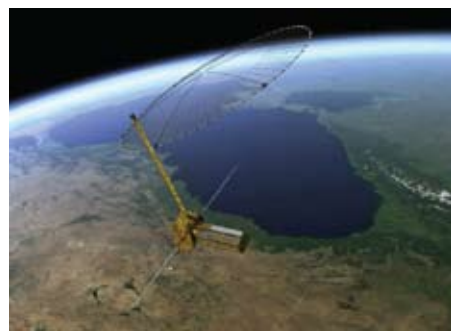


## Small Farmers' Agribusiness Consortium to Launch Online Platform for Farmers to Connect with Potential Buyers

➤ Further strengthening its efforts to create effective market linkages for Farmer Producer Organisations (FPO) across the country, the Small Farmers' Agribusiness Consortium (SFAC), a specialised agency under the Ministry of Agriculture, will soon unveil a unique portal that will enable FPOs connect with potential buyers. SFAC has played a pivotal role in mobilising farmers across the country into forming FPOs, which have enabled farmers in enhancing productivity and earning better returns from their produce. The portal is being developed with the objective of connecting farmers to other stakeholders such as buyers, retailers, exporters, processors and wholesalers. It will serve as a common platform for buyers and sellers to interact with farmers, which in turn will help them earn the right prices for their produce. The portal is first of its kind and is focussed on plugging the information gaps between FPOs and organised buyers. Explaining the importance of creating market linkages for FPOs, Shri Sumanta Chaudhuri, IAS, Managing Director, Small Farmers' Agribusiness Consortium said, "Market linkages remain one of the crucial areas for FPOs to emerge as successful enterprises and SFAC has played an integral role in opening up marketing channels for FPOs in India. SFAC will act as a facilitator to link both the stakeholders at a single platform. SFAC will certainly facilitate the process of providing real time information on the portal by FPO and Buyer, where any subsequent trading is to be undertaken directly between FPO and Buyer."

## ISRO to Monitor More Crops via Satellites

➤ Indian Space Research Organisation (ISRO) is building more remote-sensing satellite capacity as it looks to expand space-based agricultural forecast to cover over 23 crops from the existing eight in the country, according to a top official. So far, the agriculture ministry tracks the production of eight crops, including rice, cotton, sugarcane and jute, looking at total area of crop acreage and its development to forecast the produce for harvest. The improvement in forecast has led to demand for satellites to cover more crops, Isro chairman K Sivan informed. ISRO has over a dozen remote sensing satellites but the demand for applications has increased its focus to plan atleast six more satellites dedicated to land and water, cartography, oceanography and environment, including meteorology and weather monitoring. It includes cartosat-1 and 2, Resourcesat, Risat-1 for all weather, dawn-to-dusk imaging, disaster management and agricultural monitoring. These satellites will help in more accurate crop acreage and production estimates; assessment of flood and drought damage, environmental monitoring.





## Passengers can now relish organic Alphonso mangoes in trains

➤ Rail passengers can now buy fresh, organic Alphonso mangoes from Ratnagiri in Maharashtra in trains. Indian Railways has tied up with a self-help group that will sell the mangoes at a discounted price. According to Railways, the self-help group will sell the mangoes at a price of Rs.470 per dozen. This is a first-of-its-kind effort to offer seasonal fruits in trains. “Under the e-catering project, Shree Mahalakshmi Swayam Sahayata Bachat Ghat, famous for its export-quality Alphonso mangoes, has shown interest in selling fresh and naturally ripened organic mangoes to passengers,” said the Railways. Former Railway minister Suresh Prabhu, in his rail budget speech in 2016-17, had announced the Railways’ partnership with self-help groups to support their work and products. “Self-help groups not only provide employment to women but also respect and dignity. IRCTC (Indian Railway Catering and Tourism Corporation) has begun the process of empanelling self-help groups for providing catering/cooking services. We are partnering with NABARD (National Bank for Agriculture and Rural Development) to provide support and access to our IRCTC website to ensure extensive e-marketing for products produced by self-help groups, which would lead to increase in rural incomes,” Prabhu had said in his budget speech. The Railways has also tied up with Trapigo, a last-mile business-to-business logistics service provider for food products which is a start-up launched by graduates from the Indian Institute of Technology, Indian Institute of Management and National Institute of Fashion Technology.

## IT-Kgp Ploughs New Fields, to Use IoT to Monitor Soil Health

➤ Researchers at Indian Institute of Technology in Kharagpur (IIT-Kgp) have developed a smart solution for farmers based on Internet of Things (IoT) to help monitor soil moisture, soil temperature, nutrient contents and water levels. Researchers from its department of computer science and engineering have developed a prototype using batteryless sensor nodes to monitor agricultural field parameters. This solution can also be used in other areas like construction, traffic management and health-care systems. There are two parts to this solution both of which do not need any Internet connectivity, allowing the solution to work even in the remotest parts of the country. One part of the device is placed in the field. It uses sensor nodes and has a processor, a radio unit and sensors for reading the soil moisture, soil temperature and water level in fields. The other portion is handheld, which tracks or reads the data from the device present on the field.





# CROP PROTECTION

## PROTECTING CROPS, PROTECTING FOOD SECURITY

Indian Agriculture as an industry has the mammoth task of catering to the food demands of the constantly increasing population of the second most populous country in the world and providing employment to the largest number of people in the country. The economic safety and nutritional guarantee notwithstanding, the rural economy of the country has a direct bearing on the stability of agriculture and so to an extent on the general economy of the country. So it becomes imperative by any standards to maintain, develop and expand the India's agricultural footprint.





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**T**he agriculture, world over and India in particular, faces innumerable challenges. The highly monsoon dependent vocation has an inbuilt instability in terms of production and productivity, thereby constraining the yield, at many occasions. With the irrevocable expansion of population, it becomes pertinent to enhance production by all means. In such instances, the production increment strategies also involves minimizing losses. About 15-25% potential crop production is lost due to pests, weeds and diseases. Hence a responsible crop production and management requires adoption and implementation of practices that critically address this portion of loss. Crop Protection practices thus becomes an important aspect of agriculture.

#### **Assessing Pesticide Industry**

Chemicals manage most plant diseases and pests with a finality. Crop protection chemicals when applied in recommended doses can bring down the impact of pest

and diseases to a considerable extent. However, this route of crop protection has been recommended as the last resort due to its implications on health and environment, especially when and where other control measures fail. India figures only at the end in terms of consumption of pesticides. At present, per hectare consumption of pesticides in India is amongst the lowest in the world and stands at 0.6 kg/ha against 5-7 kg/ha in the UK and 13 kg/ha in China. Use of crop protection chemicals can increase crop productivity by 25-50%, by mitigating crop loss due to pest attacks. Crop protection chemicals thus becomes very essential to ensure food and nutritional security.

India is the fourth largest global producer of agrochemicals after the US, Japan and China. This segment generated a value of USD 4.4 billion in FY15 and is expected to grow at 7.5% per annum to reach USD 6.3 billion by FY20. Approximately 50% of the demand comes from domestic consumers while the rest goes



### Crop Protection Strategies

Pest, Disease and weeds – the fearsome trio is responsible for the wastage of a considerable amount of agriculture produce. Besides, these usual suspects, rodents, nematodes, plant parasites, snails and nematodes have also been able to inflict monumental losses to the crops. The damages would run to formidable numbers if we do not adopt management practices suitably. According to a study by the Associated Chambers of Commerce and Industry of India, annual crop losses due to pests and diseases amount to Rs.50,000 crore (\$500 billion), which is significant in a country where at least 200 million Indians go to bed hungry every night. Plant protection therefore is highly relevant for a country like India.

Plant protection decisions are usually dependent on many factors. In today's world, sustainability is a crucial determinant. Chemical means of control are absolute, but their effect on the environment and the humans have been detrimental. So crop protection measures have been centered around a combination of all the available strategies in an integrated manner. Integrated Pest/Disease/Weed Management thus employs effective and environmentally sensitive approach to pest management that relies on a combination of common-sense practices. The UN's Food and Agriculture Organization defines IPM as "the careful consideration of all available pest control techniques and subsequent integration of appropriate measures that discourage the development of pest populations and keep pesticides and other interventions to levels that are economically justified and reduce or minimize risks to human health and the environment. IPM emphasizes the growth of a healthy crop with the least possible disruption to agro-ecosystems and encourages natural pest control mechanisms.

IPM measures includes growing resistant/tolerant varieties, cultural practices such as decoy crops/trap crops, crop rotation, mixed cropping etc., physical control measures such as seed treatment, soil solarization, etc., chemical measures and Biocontrol options. Lately, genetic engineering has also been employed as a crop protection measure.



towards exports. While the domestic demand is expected to grow at 6.5% per annum, exports are estimated to grow at 9% per annum during the same period.

The Annual Survey of Industries data show that the industry comprises around 600 companies, of which more than 60 per cent are involved in producing insecticides, fungicides and herbicides. The 4-company concentration ratio in 2014-15 was 19 per cent, showing that top-4 companies produce one-fifth of total output of the industry. The 8-company concentration ratio was 29 per cent. Subsidies form a meager part in this industry. The total production subsidy received during the year 2014-15 amounts to Rs. 12 crores, which is only 0.03 per cent of total output produced.

The Indian crop protection market is dominated by Insecticides, which form almost 60% of domestic crop protection chemicals market. The major applications are found in rice and cotton crops. Fungicides and Herbicides are the largest growing segments accounting for 18% and 16% respectively of total crop protection chemicals market respectively. Rice and wheat crops are the major application areas for herbicides. Increasing labour costs and labour shortage are key growth drivers for herbicides. The fungicides find application in fruits, vegetables and rice. The key growth drivers for fungicides include a shift in agriculture from cash crops to fruits and vegetables and government support for exports of fruits and vegetables. Bio-pesticides include all biological materials organisms, which can be used to control pests. Currently bio-pesticides constitute only 3% of Indian crop protection market; however there are significant growth opportunities for this product segment due to increasing concerns of safety and toxicity of pesticides, stringent regulations and government support. Andhra Pradesh (including Telangana & Seemandhra), Maharashtra and Punjab are top three states contributing to 45% of pesticide consumption in





India. Andhra Pradesh is the leading consumer with 24% share. The top seven states together account for more than 70% of crop protection chemicals usage in India.

With an increasing thrust on improving crop productivity and reducing crop losses, India is a fertile market for crop protection chemicals. India is slowly emerging as an important exporter of pesticides. Mostly off-patent products, majority of export takes place to Brazil, USA, France and Netherlands. Low cost manufacturing, availability of technically trained manpower, seasonal domestic demand, overcapacity, better price realization globally and strong presence in generic pesticide manufacturing are the strong growth drivers in this segment and hence India also offers good scope for contract manufacturing as well. Agrochemicals worth USD 4.1 billion are expected to go off-patent by 2020. This provides significant export opportunities for Indian companies which have expertise in generic segment. A strong export base has to be generated by Indian companies through strategic alliances and partnerships. Merger



and acquisition opportunities could also be explored to increase their global presence.

Herbicides, a hitherto small player in crop protection segment, is increasing its share in India. Labour shortage, rising labour costs and growth in GM crops has led to growth in the use of herbicides. The herbicide consumption in India stood at 0.4 USD billion in FY15 and is expected to grow at a CAGR of 15% over the next five years to reach around 0.8 USD billion by FY20. The fungicide industry is also showing similar trend, thanks to India's new found interest in horticulture, which has grown at

a CAGR of 7.5% over the last five years. In general the per hectare consumption of pesticides in India is amongst the lowest in the world and currently stands at 0.6 kg/ha against 5-7 kg/ha in the UK and at almost 20 times ~ 13 kg/ha in China. In order to increase yield and ensure food security for its enormous population, agrochemicals penetration in India is bound to go up. Besides these, a renewed energy has been noticed in the agriculture segment with thrust on formation of units like Farmer Producer Organizations (FPOs). Their collective strength has augured well for the crop protection segment. Availability and dissemination of



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appropriate technologies through several start ups and the extension wing of many corporate players have increased the awareness and consumption of crop protection chemicals.

However, there remains many grey areas that are yet to be addressed. There is a significant share of spurious pesticides available in the market. More than 40% of the pesticides sold in India in FY14 were tested as Spurious. These products are inferior formulations which are unable to kill the pests or kill them efficiently. They also result in by-products which may significantly harm the soil and environment. Apart from crop loss and damage to soil fertility, use of non-genuine products leads to loss of revenue to farmers, agrochemical companies and government. There is a lack of awareness amongst the farmers and this makes it immensely difficult for them to differentiate between genuine and non-genuine products. Stringent environmental regulations across the world are increasing the cost of developing new products and simultaneously delaying the introduction of new products in the market.



### Registration and Quality Control

The Insecticides Act (1968) and Insecticides Rules (1971) regulate import, registration, production, sale, transport, distribution and use of pesticides with a view to prevent risk to human beings or animals. All pesticides have to necessarily undergo the registration process with the Central Insecticides Board and the Registration Committee (CIB&RC) before production or sale. For manufacturing or import, applicant submits data on various aspects, including chemical composition, toxicity, bioefficacy, etc. to CIB&RC. On some aspects, (particularly bioefficacy of pesticides) published, authentic report of R&D organizations is also considered as a valid data source. The Committee after ensuring the validity of application provides a registration number and certificate. As on June 2017, total 279 products (265 chemicals and 14 bio-pesticides) and 658 formulations including combinations were registered with CIB&RC. There are regulations and procedures for testing pesticides at different stages. The Central Insecticide Laboratory (CIL) is mandated to test the referral samples submitted by any officer or agency of the Central or State Government, while State Pesticide Testing Laboratories (SPTL) mainly test the samples taken at the manufacturing and point-of-sale for quality control. Results of STPLs indicate that around 2.5 to 3 per cent of samples tested were misbranded (not as per the label) during 2008-09 to 2012-13. In total, 28 pesticides and four formulations are banned for manufacturing, import and use, eight pesticides are withdrawn and 13 pesticides are restricted for use in the country. Recently, on the advice of an expert committee, 12 pesticides are completely banned from January 2018 and another six from December 2020 (DAC&FW, 2016).



This has become a dampening factor for innovation and development. Research and development demands huge capital investment and many domestic companies are hence exceedingly reluctant to invest in innovation. Indian Companies spend only 1-2% of their revenues in Research and Development as against the global MNCs which invest about 8-10% of their revenues. This makes Indian manufacturers uncompetitive globally in specialty molecules. Another major bottleneck is the Lack of knowledge and awareness among farmers regarding the appropriate kind of pesticide, its dosage and quantity and application frequency. Owing to linguistic differences it also becomes difficult to convey the same to a large number of farmers. Hence the interface between farmers and the manufacturers are the retailers who don't have adequate technical expertise and are thus unable to impart proper product understanding to the farmers. It is also very difficult for the farmers to convey their needs effectively to the manufacturers. Lack of efficient distribution system also makes it difficult for agrochemical companies to reach out to the farmers and promote their products and educate them about their benefits.

### Biological Alternative

Excessive and indiscriminate use of



pesticides with scant regard to their toxicity has led to a deluge of instances of pesticide contamination, poisoning and pesticide residue in agricultural products. Notwithstanding the effects on environment, the injudicious use of pesticides have incited many

health hazards in humans as well. Endosulfan poisoning in Kerala - the longest running instance of pesticide poisoning and the recent Yavatmal tragedy are all pointers that we need to search for better alternatives. Biological control which employs nature's defenses against diseases and pests as biopesticides or Biocontrol agents, is one of the alternatives that has been employed in agriculture.

Bio-pesticides have the potential to control crop losses and reduce negative environmental impacts. Bio-pesticides constitute around 3 per cent of pesticide market in the country. So far 14 bio-pesticides have been registered under the Insecticide Act 1968 in India. Consumption of biopesticides has increased from 219 tonnes in 1996-97 to 683 tonnes in 2000-01, and further to around 3000 tonnes in 2015-16. In India, so





far 166 exotic biological control agents have been introduced of which 33 could not be released in the field, 71 recovered after release, 6 providing excellent control, 7 substantial control and 4 partial control. Studies indicate that use of bio-pesticides in integrated pest management can reduce pesticide use by 66 per cent in cotton and by 45 per cent in cabbage. Thus, bio-pesticides can play an important role in shifting the focus from chemical pesticides to reliable, sustainable and environment friendly options.

Worldwide there are about 1400 biopesticide products being sold. At present, there are 68 biopesticide active substances registered in the EU and 202 in the USA. The EU biopesticides consist of 34 microbials, 11 biochemicals and 23 semiochemicals, while the USA portfolio comprises 102 microbials, 52 biochemicals and 48 semiochemicals. These biopesticide products represent just 2.5 per cent of the total pesticide market.

However, the transition from chemical to biocontrol may not be a smooth one considering many challenges spread out for the bio pesticide commercialization. Many bio pesticides have high levels of selectivity, which means that bio pesticides are niche market products with low profit potential. Hence adopters of bio pesticides face large fixed costs of adoption that will only decrease once the technology is used more widely. Bio



pesticides are living entities and their efficacy depends on the proper storage. Storage of bio-pesticides requires special facilities and skills, which should be developed at all levels in the supply chain. Also, if necessary, fiscal incentives may be provided for production and use of bio-control agents.

### Genetic Modification – Successful but controversial

With time, technology took many manifestations in search of alternatives for application of chemicals to control pests and at the same time derive effective means to address the problem. During 2002, one such breakthrough happened in India in cotton.

Cotton, an important cash crop to India





was prone to boll worm infestation. The conventional methods failed to guarantee a reasonable control. Bt cotton was an effective remedy to this problem. The Bt crops carries a gene engineered to it to produce a toxin, rendering the plant toxic to pests. India went ahead with rapid adoption of Bt varieties in cotton. In 2009-10, Bt cotton spread to 85 per cent of the country's cotton area. It was claimed that this took the country's production to new heights.

A study jointly undertaken by the Council for Social Development (CSD) and Bharat Krishak Samaj, has reported that the overall production of cotton has grown by 9.25 per cent since the introduction of Bt cotton in 2002-03 and farmers' income has gone up by nearly 375 per cent. The study titled 'Socio Economic Impact Assessment of BT Cotton in India' indicated that high-yield hybrid cotton seeds resulted in lower pesticide use and have helped cotton farmers to get better yields.

Since, the introduction of Bt cotton in 2002, there has been a near doubling of cotton production in the country. At present, 96% of cotton cultivated in India is under Bt cotton crops. Cotton production rose from 14 million bales in the pre-Bt year of 2001-'02 to 39 million bales in 2014-'15, a rise of almost 180%. India's cotton imports fell, exports grew and as of 2015-16 India is expected to have overtaken China as the biggest cotton producer in the world.

The genetically engineered crop varieties offer a promising direction as it combines the qualities of pesticides without polluting the immediate environment with harmful chemicals. But the lack of confidence in the genetically manipulated technologies and the lingering doubts about the crossover of these 'foreign' genes to local varieties has marred the prospects of this technology. There is considerable resistance in introducing the technology to food crops.

It has been ten years since the introduction of Bt cotton and no other Bt product has been approved for commercial cultivation so far. Even the field trials have been met with hostility from the public and environmental activists. A classic case is that of Bt brinjal, the introduction of which is still pending today owing to the differing positions adopted by the state governments, the lack of consensus among the scientific community, the incompleteness of tests and lack of independent professional mechanism to instill confidence in the general public. Bt mustard has also been shelved.

Food security is critical to any country's development. Unfortunately, the food production has to come from limited resources and hence as a country we cannot afford to lose the food produced to pest and diseases. This requires a robust crop protection regimen that is not only effective but also sustainable. ■



# 'Agriculture can take our GDP from 7.5% to 10%'

It is a matter of pleasure that our country has become second after China in Agriculture GDP surpassing USA and for this, credit goes to our hard working farmers.

As per data our country's agricultural production amounted to 356 Billion Dollar, while China's 1036 Billion dollar and USA's 192 US Billion dollar in 2014. All credit goes to the agriculture and farmers for their initiatives and hard work. Without much support they have made India second in GDP, and if proper support would have been provided, they could have brought our country to No.1 in the Agriculture GDP.

Our agriculture land area is 191 million hectares and that of China is 167 million hectares. Our average rainfall is 1083 mm and China's rainfall is 645 mm. Despite this, they have around three times GDP from agriculture in comparison to our country. We did an analysis on how China, which was just equivalent or behind India, could grow so fast, as all the growth has happened in last 30 years. The reason happened to be new

technology that was available to their farmers. Unfortunately, our farmers remain ignorant of the new technology as the present system and strategy of Government Extension is not sufficient to reach the large number of farmers.

As per 37th Standing Committee (under Ministry of Chemicals and Petrochemicals) Report of 2002, they have estimated crop loss of around Rs.90,000/- crores due to non use of pesticides, weedicides, fungicides and on the basis of today's MSP, the loss would amount to more than Rs.4.0 lakh crores. While answering the questions in Parliament, the Government has also accepted that there are 10-30% crop losses, and if we are successful even in saving 15%, our GDP can be improved considerably.

Our Hon'ble Prime Minister while addressing the public meeting on 28.2.16 has given the call for Doubling the Farmers' Income by 2022 and here the first question that comes to mind is whether it possible or not? Our Hon'ble PM whose vision is unmatched and his target of Doubling Farmers' Income is easily possible. If Chinese farmers can do, then why not our farmers?



**Shri RG Agrawal**  
Chairman, Dhanuka Agritech Limited





For Doubling the Farmers' Income these few initiatives can be considered.

**Technology** – There are more than Five Lakh input dealers today and if they are given training, then they may prove very good extension services provider. We have experimented this in 2006 with MANAGE. MANAGE has designed a Diploma course (DAESI). Our company has written to all the universities that our company will sponsor first batch of 40 dealers with 50% subsidy of fees i.e. Rs.10,000/dealer as MANAGE has fixed fees of Rs. 20,000/-. We have already completed this arrangement with 3 universities of Gujarat i.e. Anand Agricultural University, Navsari Agricultural University and Junagadh Agricultural University. Some more universities have shown their interest e.g. PAU, HAU, BHU, GBPUAT and Akola. We will soon begin the training program at the earliest.

**Right Quality Input** – In input first is soil management. Government has taken very good initiative to issue Soil Health Card to farmers. But on the basis of Card, there should be someone to advise them on which crop which fertilizers including micro nutrients, compost, green manure and bio fertilizers including bio stimulants should be used. Right dose of fertilizers will help as earlier our Govt subsidy was only in Urea. So farmers used disproportionately urea which instead of being beneficial was harmful. Our Hon'ble PM has also called for reducing the Urea consumption by 50% by 2022 and use fertilizer based on soil health card.

**Seed Treatment** - Apart from Hybrid Seed, seed treatment is very important. In 2007, a campaign of 100% seed treatment was started by our company jointly with the Ministry of Agriculture. The campaign slogan was 'Jaise Her Bachche ko Polio Ka Tika Vaise Her Beej ko Suraksha ka Tika'. Our company has done lot of work in this field and continues farmers training.

**Plant Protection**– There is a myth about crop protection chemicals but the fact is entirely different. Our country's pesticides consumption is very nominal (600 gm per hectare while China use 13 kg per hectare) in comparison to the world. That is one of the reason large portion of crops is lost by insects, fungus, weeds as well as during storage by rats and other pests. As per the All India Pesticide Residue Network Project of the Govt. of India, in the past six years over 1,13,000 samples of various food items were analyzed and hardly in 2% samples, pesticides residue was found above MRL, while in several European countries, the percentage of samples above MRL were around 4-5 %.

**Organic** - Dr. K.K.Sharma, Network Coordinator, All India Network Project on Pesticide



Residue, IARI analysed 166 samples in Government Laboratories (AINPPR, ICAR). The analysis showed that 27% samples contained pesticide residue and in these 4.8% were organic vegetable samples and had pesticide residue above MRL. Organic farming is good for niche market only as Noble Prize Winner Dr. Norman Borlaug said there are 6.6 billion people on the planet today. With organic farming we could only feed four billion of them. Which two billion would volunteer to die?

**Myths Regarding Pesticides:** Pesticides prevent our crops from weeds, Insects, pests and increase farmers' income. Even then, some NGOs, urbanites, environmentalists and media, due to their own ulterior motives and/or for reasons best known to them, under the garb of saving environment, human concern and safety, have been voicing hoarsely against use of pesticides for raising crops. Recently there was an NGO report which said that in vegetables and fresh fruits, residue of banned pesticides like Aldrin, Dieldrin, Heptachlor and Chlordane were present. These pesticides have already been banned in India about 30 years ago. There is no chance to get residues of these pesticides in fresh fruits and vegetables. For their vested interest, these NGOs are spoiling our country's image and government should take strict action against them. As analyses of 1,13,00 sample by AINPPR revealed that no banned pesticide residue has been found which prove that their reports are false and misleading.

Lastly, if we give right focus to Agriculture which has been given by Government of India in last two budgets and in current budget the special attention and recent announcement of Govt of India to give 50%+ of the cost as per Dr Swaminathan Committee recommendation will definitely create more money in the hands of farmers to uplift their livelihood. If farmers get more money their spending power will increase which will increase the demand for all goods resulting in growth of the industry, employment which can take our GDP to more than 10%. If it is achieved, our country will become No.1 in the overall GDP in the world.

# ‘INDIA HAS A GREAT OPPORTUNITY IN AGRO CHEMICALS EXPORTS’

Four decades into its establishment, Bharat Insecticides Limited (BIL) has a nationwide network of 26 offices, 60000 dealers and 5500 distributors with strategically located warehouses. Recognized as an Export House, BIL has exported its products to more than 65 countries. CHEMEXCIL (Basic Chemicals, Pharmaceuticals & Cosmetics Export Promotion Council), set up by the Ministry of Commerce & Industry, commended the company for Outstanding Performance in Exports with ‘Certificate of Merit’ in the category of Inorganic & Organic Chemicals for the year 2008-09. With two manufacturing plants, located at Bahadurgarh that comes under Delhi NCR and Kathua in Jammu and Kashmir, BIL manufactures insecticides, fungicides and herbicides with applications in agriculture, preventive public health measures and veterinary treatment formulated in various concentrations, quantities and fool-proof packing. In an interview with Agriculture Today, Mr. SN Gupta, Director of Bharat Insecticides Limited discussed the general scenario of crop protection segment in India and the challenges faced by the segment.



## What is the outlook for the crop protection industry in India?

Crop Protection industry in India will continue to grow significantly (6.5% per annum) in coming years because of various factors – more demand for Fruits and Vegetables due to more disposable income, need to grow more food to feed growing population, more demand

of weedicides as a result of labor shortage, plant stress management due to climate change etc. For 2018, the sentiments for Crop Protection industry are positive on prediction of normal monsoon by IMD. For Crop Protection industry to do well, it is important to have good spread of rains - geographically and over time. Due to stringent Pollution

control measures in China, there is a supply constraint of many Agro Chemicals and intermediaries which are imported from China. This may lead to increase in price of few Agro Chemicals.

## What is India's share of crop protection products in the world market?

World Crop Protection market is about 55Bn \$ while Indian market is 2.6 Bn \$. India's share is about 5% of the world market. Even though India is globally second in Agricultural production behind China, it is having much lower consumption of pesticides compared to other countries. It ranks 11th in terms of pesticide consumption globally, even lower than small countries like France and Spain.

### **In terms of global trade, what are the opportunities for India in the crop protection segment?**

Due to low cost of production in India there is great opportunity for exports of Agro Chemicals from India. Due to environmental issues in China and strict pollution control measures being undertaken, cost of production has gone up in China as well and this has resulted in significant opportunity for India. Export of Agro Chemicals are expected to grow by 9% per annum between 2015 to 2020.

### **How significant is the threat of spurious pesticides? How can we address it?**

The current market of spurious pesticide is at about Rs 3,200 crore constituting 25% by value and 30 % by volume of the total domestic market of agro chemicals in India (Study on Sub-Standard, Spurious/Counterfeit Pesticides in India released by Tata Strategic Management Group). Many Agro Chemicals are also sold under the garb of Bio pesticides. Strict action is required against the Manufacturers and the Retailers who are involved in manufacturing and selling of spurious products. There is also need for farmers to be educated on the topic.

### **How successful are organic measures to address crop protection?**

Globally area under organic farming is quite small as it is difficult to protect crop with biological methods alone. Organic food is also expensive due to high cost of production. In next few years, India will be the most populated country in the world, beating China. The biggest challenge for us will be to feed

a population of more than 1.5 billion. As yield through organic cultivation is limited, it will be difficult to feed the entire population by following Organic cultivation.

### **What are your views on the new Pesticide Management Bill?**

The current Insecticide Act 1968 is 50 years old, although a number of amendments have been incorporated, a comprehensive review is required. This will give clarity on lot of ambiguous rules and laws of existing act. Harsh punishment for misbranded and substandard products will help in keeping check on spurious pesticides. Immense power to the Insecticide inspectors may bring back the Inspector Raj. Import of formulations without registration of its technical (a.i.) should not be allowed. Registration of technical grade of pesticide should be made mandatory prior to the registration of its formulation/s.

### **What are the future products that the industry is looking forward to?**

The farmers are looking for products which can provide long duration protection to crops and broad-spectrum control as cost of labour for application is going up. Industry is looking forward to launch products providing above benefits. Industry is working on to launch environment friendly formulations. Industry is also looking forward to introduce new weedicides for Wheat, Rice and Soybean to overcome resistance, better insecticides for BPH and other sucking pests. Plant health and Nutrition is another upcoming segment in India.

### **Are you satisfied with the level of R&D happening in Crop Protection sector in India?**

No. Globally MNCs are spending around 8-10% of their earnings on R&D. It takes 11 years and \$286 Mio investment to get one new pesticide to farmers. Indian companies do not have this kind of budget and also there is not enough support from Government on R&D in Crop Protection.



# HUNGER FREE JAMMU & KASHMIR STATE (WAY FORWARD)

**W**ith a total geographical area of 24.16 lakh hectares spread across 22 districts, 82 tehsils, 142 community blocks, 4136 panchayats, 6652 villages, and supporting a burgeoning population of 125.48 lakh, with a rural population of 60.77%, J&K state is a predominantly an agricultural state. There is a widening gap between total cultivable area (11.33 lakh hectares) and net sown area (7.34 lakh hectares) and area sown more than once (3.99 lakh hectares). The figures clearly indicate that this gap has to be bridged to augment the food resources, if the state has to prosper. This gap between total cultivable area to net sown area is about 3.99 lakhs hectares and net

sown area to area sown more than once is about 3.35 lakh hectares. One thing has to be clearly understood that there is an enormous scope to boost agriculture production through the rational use of land resources by way of horizontal and vertical expansion and both are achievable in time and space. This gap of 35.21% between total cultivable area and net sown area and 54.35% between net sown area and area sown more than once is a huge one, and if properly utilized could significantly enhance food production even at the static rate of productivity per unit area and time. Therefore, efforts have to be made to motivate the farming community for utilizing these land resources through the

efficient land use by way of increase in cropping intensity (At least 200%), mixed cropping, double cropping remunerative crop combinations, multiple cropping, high yielding and short duration crop varieties.

The state though bestowed with enormous water bodies, has only 3.03 lakh hectares under all sources of irrigation (Canal, tanks, wells and other sources). Thus it is evident that nearly 60% of the net sown area is devoid of irrigation facilities and thus largely depend on precipitation which is showing a disturbing trend due to erratic rainfall pattern and western disturbances and impact of climatic change can be largely



attributed to loss of vegetal cover, rising temperatures, glacier melt and casual approach towards forestation and watershed treatment. There is a need to develop a village each in each district of the state under "MODEL VILLAGE CONCEPT" and each model village shall act as a window to showcase technology adoption in a scientific manner. These models shall comprise of agri/horti/forestry models suited to various topo sequences, need and demand.

There is a need to draw an action plan for flood prone areas, drought situations, wasteland development, watershed management, in-situ and ex-situ bio-diversity conservation, conservation of indigenous vegetables and pragmatic programme for underutilized vegetables and boost to kitchen garden concept. There is a need to have a "BOARD" comprising various specialists to draw a master plan and implement the same through NGOs and retired agricultural scientists having vast experience and could easily interact with the farming community and make them to adopt latest technological innovations suitable to different agro-ecological niches.

There is a complete miss-match between technology generation and their dissemination. The percolation rate is just 30-40% even at the national level and about 60-70% of the technology does not percolate down and there is a need to bridge this gap by finding out the cause and effect relationship and may possibly attributed to poor extension network, inaccessibility of far flung areas, poor farmers acceptability level, lack of communication skills and poor monitoring and/or lack of user friendly technologies. We should, therefore, use all our energies to reach out to the farming communities and understand their plight and problems in not accepting/adopting these innovative technologies. The solution has to be found out even if there has to be a moratorium on technology generation and focus all attention on their dissemination.

The need of the hour is to select an enterprise with low cost technology, thereby, less initial investment, and

with dependence on locally available cheap raw material with job oriented approach for attaining economic sustainability. Mushroom cultivation can be the most appropriate and viable enterprise as it involves low cost technology and it utilizes farm waste as the essential raw material. Moreover, the temperate climate prevailing in the valley is quite suitable for most part of the year and is also energy independent and it is possible to have two crops of mushroom in Kashmir from mid Feb to May/June and July to Oct/Nov, while as in plains it is possible to have only one crop. Further, the raw material in the form of agricultural waste as paddy/wheat straw, seed hulls, corn cobs and industrial/ household waste is available in plenty. Therefore, efforts must be put in place to develop mushroom trade in a big way involving rural ladies and un-employed youth especially in establishment of spawn production labs and pasteurized substrate units. This would substantially generate any thing between Rs. 10000-15000 with at least 400 man days for his family and the society.

The state of Jammu & Kashmir, represents, one of the most important bee keeping areas in the entire country due to the vast diversity of natural resources and salubrious climate. The state is known for its floral gaiety with numerous types of cultivated and wild plants that bloom from early spring to late fall. There is a great need to concentrate on this particular enterprise not only to generate farm income, but also to aid in establishment of bee flora, besides enhancing the apple productivity through much needed pollination.

Himalayas, of Jammu and Kashmir state, the most important niche, is repository of rare, least evolved and most modern gene pool. It has rich faunal and floral diversity. The forests of J&K alone hold gene pool of more than 700 known floral species besides scores of faunal species. The state has diverse Zoo-geographical regions which are home for varied animal forms. It is also home of hundreds of medicinal, aromatic and agro-horti plants which are mostly represented

by their eco-types/land races and wild relatives.

Keeping in view, the importance of biomass dependent economy of the state, highest priority has to be given to their intensification and diversification to ensure livelihood of the people at large.

Another area of concern is the food wastage as the food grains are lost during the harvest and post-harvest handling. It is officially estimated that the post-harvest loss ranges from 25-35% among the food grains. The wastage of perishable items like vegetables and fruits also add to the overall food basket lost in the system. The main reason attributed to loss of quantity and quality of grains is the poor storage and transport facilities. The spoilage also occurs mainly due to rodent pests and diseases, which are commonly associated with inadequate structures and seepage of water during rainy season. The long distance transport of grains in poor quality bags exposed to weather fluctuations lead to further damage. It would be difficult to quantify the losses, however, the loss will vary from crop to crop, season to season and over all mechanism of operation and facilities. Therefore, there is an urgent need to over haul the total system of storage, transportation and processing. If this is taken care of, the state of J&K would not have to import food grains any more.

The holistic approach to tackle the present situation is to create awareness amongst the farming communities about the available financial schemes which is a great impediment at the moment plus there is a need for special audit of these schemes about the pattern of fund utilization, modus operandi for selection of beneficiaries, level of adoption and monitoring by a neutral team.

Further, the total agriculture is losing sheen for the fact that there is no control on land use planning, diversification of agriculture land for construction purposes, shying away of newer generation from farming as it looks no more remunerative for the lack of value addition and marketing facilities. This is a matter of great concern and needs attention.

**M. Hussain Shah**



# MARKET LED EXTENSION

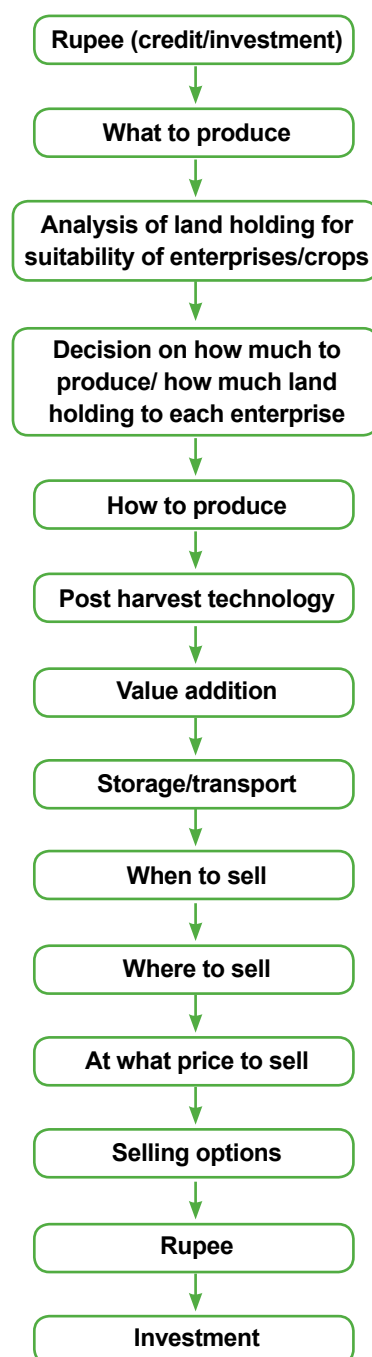
## EMPOWERING THE SMALL HOLDER FARMERS

**A** rural farming community in India mostly deals with small or marginal category and agricultural extension is essential for them to respond precisely to the diversified demands of the domestic and export markets. India owns one of the vast extension systems in the world, and its trained man power and the public agricultural extension system played a major role in imparting knowledge and skills to the farmers during the Green Revolution period. However, in the last two decades the linkage between research, extension, and farmer has become weak and public funding for agricultural R&D has also come under scrutiny because of the uneven performance of agricultural sector. In the current Indian agricultural scenario, where there is a wide distinction in the socio-economic strata of farmers living in the same locality, treating agricultural extension as a simple medium to communicate those technologies that have performed well in the research fields

to farmer's fields may not work well. Since farmers receive most of the technical know-how from agricultural extension system it is high time to look beyond to a more inclusive livelihood extension.

Reforms in the extension system are common worldwide phenomenon and many countries including India are on the way of reorienting its agricultural extension service system. There is no doubt that a decentralized and demand-driven extension approach helps the farmers to set their targets and also to demand for their extension and research priorities. Market-led extension is one of the new dimensions of agricultural extension that envisages farming as an enterprise with diversified options of technology packages to suit different farming situations. The approach is a perfect combination of agriculture, economics and extension equipped enough to reach the door steps of common man with the help of appropriate technology packages. In India, market-led extension initiatives mostly implemented through self-

### FLOW CHART OF AGRICULTURE TO BE AN ENTERPRISE:





help group (SHG) approach. Most of SHGs are supported by different Non governmental Organizations (NGOs) working in the rural areas. As these organizations remain close to the producer group they are responding quickly to direct needs of farmers compared to the public extension system. In this way, Market-led extension through self-help group approach facilitate the decision making of farming community by lessening their uncertainties related to “what to produce, when to produce, how much to produce, when and where to sell, at what price. With the globalization of market a farmer will have to transform himself from mere producer in the domestic market to producer-cum-seller in a wider market sense in order for best realization of the returns on his investments, risks and efforts. As per study, agriculture strategies are not sufficient to cop up with higher yields by reducing cost of cultivation but also augmenting the farmer’s income by diversifying farming and realising employment opportunities in agro-industries in the rural areas. Efforts should be strengthened to achieve higher productivity with sustainability of soil and crop. In order to survive the competition, both in domestic and international market, the focus should be on High quality produce, Low cost of production and High productivity. An efficient marketing system is essential for the development of agricultural sector. The marketing system contributes greatly to the commercialization of subsistence farmers. Failure to develop the agricultural marketing

system is likely to negate most the efforts to increase agricultural production. In the changing scenario of Indian agriculture, the extension system is likely to undergo following series of crisis.

- **Knowledge:** The extension educationists will now have to be well-equipped with the latest market information besides the knowledge of production technologies. This requires their further training and additional funding.
- **Efficacy crisis:** The extension system has already been under criticism. With the increased and enriched role the extension functionaries they will have to perform multiple activities to prove their efficacy.
- **Credibility crisis:** Despite market knowledge and efficacy in performing their role the extension system may face the credibility crisis due to rapid and unexpected changes in the market.

### Importance of Market Intelligence:

No organization can sit still and expect things to be the same month after month, year after year. At some point, something will happen to change your assumptions. And almost every decision (especially a strategic decision) is based on certain assumptions. Over time, these assumptions fall apart and if you fail to adjust with a continuous flow of new intelligence, then you will be forced to react in a way that makes it difficult to compete. Therefore, Market Intelligence can help test and validate your assumptions. Competitive



intelligence also fills in gaps, covering areas that you failed to consider in your assumptions. Enhanced roles of Agricultural Extension personnel in light of Market-led Extension and of course, competitive intelligence can yield some basic benefits:

- Source for best practices – the only real way to isolate and find “best practices” is to engage in some form of Market Intelligence; otherwise you end up relying on crude and generic type benchmarking data.
- Helps formulate strategy through an understanding of your industry, yourself, and your competitors. Market Intelligence is the essence of strategic business analysis.
- Helps identify areas for improvement as well as risks and opportunities.
- Isolates- performance gaps in relation to the competition

### SWOT analysis of the market:

- Organization of Farmers’ Interest Groups (FIGs) on commodity basis and building their capabilities with regard to management of their farm enterprise.
- Supporting and enhancing the capacities of locally established groups under various schemes / programmers like watershed committees, users groups, SHGs, water users’ associations, thrift and credit groups. These groups need to be educated on the importance, utility and benefit of self-help action.
- Establishing marketing and agro-processing linkages between farmers’ groups, markets and private processors.
- Regular usage of internet facility to get updated on market intelligence.
- Publication of agricultural market information in news papers, radio and Television besides internet.
- Production of video films of success stories of commodity specific farmers creation of websites of successful FIGs in the field of agribusiness management with all the information to help other FIGs achieve success.

### Required information to extension system and farmers

- Present agricultural scenario and land use pattern
- Suitability of land holding to various crops/enterprises
- Crops in demand in near future
- Market prices of crops
- Availability of inputs
- Usage of inputs
- Credit facilities
- Desired qualities of the products by consumers

### Prospects of market led extension

Market Led Extension has a great potential in paving surface for optimum production on a sustainable basis considering the current trend of challenges in process of food production globally. Over the years ‘lab to land’ had been much emphasized in our country now it is time to focus on farm to fork. Due to WTO, the countries around the world are no longer confined to domestic production alone. The countries with competitive advantages are looking forward to dump their output anywhere in world. However, with the new functionary role of extension personnel under Market Led Extension, future success can be guaranteed for Indian Agricultural Development. The following are some of the expected functionary role of extension personnel. This includes SWOT analysis of the market, Organizing commodity based farmers’ interest groups and farm management capacity building, Backward and forward linkage, Farmers exposure to market intelligence and guidance for quality decision about market. Therefore key answer to the above questions will empower farmers in both production market oriented knowledge which is the sole responsibility of Extension functionaries through Market Led Extension.

### Challenges in market led extension:

Extension system is gigantic in shape and is heavily burdened with

enormous activities such as healing the communication gap between the researcher and farmer. Developing good market information is so far another challenge. Good market intelligence should be comprehensive, accurate, relevant, confidential, trustworthy, and equally accessible and timely. Agricultural goods are quite different from marketing goods. The main difference is they are perishable in nature. Supply is not regular because of seasonality in production. Farmers here have small land holding which gives scattered production and variability in quality of the products. Besides the factor that we are not in a position to reap the benefits of WTO through export, one major threat our country faces is unrealized opportunity in agricultural marketing, imports by our country, underexplored export opportunities for Indian products and distortion in domestic market.

Market-led extension is an activity by which improving the great potential livelihood standards of Indian farmers as group activities bring more socio-personal and techno economic empowerment. By means of this, the broken linkages of technology dissemination system through the establishment of an effective bond with various stakeholders i.e. public or private and a bottoms-up approach in the policy decisions are essential. Further, all those grass root level organizations working effectively among the rural farming community should be identified and incorporated in system. Further, Farmers should be aware on various aspects on quality, consumer’s preference, market intelligence, processing and value addition and other marketing information. It will help the farming community to realize high returns for the produce, minimize the production costs, and improve the product value and marketability. ■

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# TROPICAL TUBER CROPS FOR RAINBOW DIET

**T**he food we eat gives our bodies the 'information' and materials they need to function properly. If we don't get the right information, our metabolic processes suffer and our health declines. If we get too much food, or food that gives our bodies the wrong instructions, we can become overweight, undernourished and we are at risk for diseases such as cancer, diabetes and heart disease. A healthy diet provides the body with essential nutrition: fluid, adequate essential amino acids from protein, essential fatty acids, vitamins, minerals and adequate calories. The requirements for a healthy diet can be met from a variety of plant-based and animal-based foods.

Tropical tuber crops are the third important food crops after cereals (rice, wheat etc.) and pulses (cowpea, pigeon pea, chickpea, lentil etc.) and

are either a staple or secondary staple for one in every five of the world population. Tropical tuber crops, which include cassava belonging to the spurge family, sweet potato of the morning glory family, yams belonging to the lily family and taro and elephant foot yam of anthurium family, are cultivated in 4.5% of the total area under vegetables contributing to 5.7% of the total vegetable production in India. They contribute to about 6% of the world's dietary energy, and are also an important source of animal feed and raw material for industrial products. The ICAR-Central Tuber Crops Research Institute (ICAR-CTCRI), an ISO (ISO 9001:2008) certified research institution located at Thiruvananthapuram, Kerala, India under the aegis of Indian Council of Agricultural Research (ICAR), Ministry of Agriculture & Farmers Welfare, Govt. of India has been conducting R&D activities of this important group

of food crops for the past 54 years and is the only one of its kind in the world doing research exclusively on tropical tuber crops. Recently, the institute has been concentrating its research activities on developing nutritionally rich varieties of these crops to meet the changing food habits of the old and new generations.

## Orange fleshed Sweet Potato

Among the naturally occurring carotenoids that can be converted to vitamin A in the human body, so-called 'provitamin A carotenoids', beta-carotene is the most abundant and most efficient one found in foods. It is a safe source of vitamin A, helping the body to reach the vitamin A levels that are essential for normal growth and development, good vision and eye health, a strong immune system, and healthy skin. It is also an antioxidant, contributing to protecting the body against the damaging effects of free radicals, which can potentially increase the risk of developing certain diseases, including cardiovascular diseases and cancer. The best sources of beta-carotene are yellow or orange vegetables (e.g., sweet potato, carrot, pumpkin and winter squash) and fruits (e.g., papaya, mango, apricot, carambola and peach) and dark green leafy vegetables (e.g., spinach, broccoli, watercress and beet leaves).

Sweet potato – which comes in many colours including purple, orange, yellow and white – is a versatile food that can be used to add that wonderful sweet flavour to everything from soups to smoothies. From anti-diabetic and antioxidant





**Sweet potato is a safe source of vitamin A, helping the body to reach the vitamin A levels that are essential for normal growth and development, good vision and eye health, a strong immune system, and healthy skin. It is also an antioxidant, contributing to protecting the body against the damaging effects of free radicals**

properties to prevention of eye-related conditions and cancer, the potential health benefits of sweet potato are wide and varied. Orange-fleshed sweet potato (OFSP) varieties are loaded with carotenoids. Consumption of foods rich in carotenoids has been associated with a number of health benefits, but they are perhaps best known for their eye health protecting properties. They have been shown, among other things, to improve night vision, delay the onset of age-related macular degeneration, prevent the development of cataracts and reduce the risk of retinitis pigmentosa.

One small boiled tuber of most OFSP variety provides 100% of the recommended daily intake of vitamin A for children and one medium tuber provides all of the needs for most women of reproductive age. The OFSP is a good source of energy, a number of B vitamins, several minerals (phosphorus, potassium) and vitamins C and K. These are vital benefits for the majority of people affected by VAD who live in rural areas where conventional VAD interventions such as supplementation and food fortification are less effective.

#### **Purple fleshed sweet potato**

Purple-fleshed sweet potato varieties have high antioxidant capacity. This is not surprising considering that anthocyanins, the flavonoid pigments that give purple sweet potato their distinctive colour, have been shown to exert extremely strong antioxidant activities. Studies show that consumption of sweet potato, taro and potato was associated with a reduced risk of kidney cancer. In another study, consumption of sweet potato was associated with a decreased risk of

breast cancer in pre-menopausal women. Yet another study investigated the effects of purple sweet potato anthocyanins in rats with colorectal cancer and found that the extract exerted anti-cancer effects in the rats. The sweet potato treatment was also found to improve glucose tolerance, a further indication of the potential anti-diabetic properties of sweet potato.

Research suggests that anthocyanin may promote healthy vision in several ways, such as by boosting circulation within the capillaries of the retina, improving night vision, reducing the risk of retinopathy in diabetics and providing protection against age-related macular degeneration.



#### **Violet yams**

Yam is a good source of energy; 100 g provides 118 calories. Its crunchy edible root is chiefly composed of complex carbohydrates and soluble dietary fibre. Dietary fibre help reduces constipation, decrease bad (LDL) cholesterol levels by binding to it in the intestines and lower colon cancer risk by preventing toxic compounds in the food from adhering to the colon mucosa. Additionally, being a good source of complex carbohydrate,





it regulates steady rise in blood sugar levels. For the same reason, yam is recommended as low glycemic index healthy food. The tuber is an excellent source of the B-complex group of vitamins. It provides adequate daily requirements of pyridoxine (vitamin B6), thiamine (vitamin B1), riboflavin, folates, pantothenic acid, and niacin.

Fresh root also contains good amounts of antioxidant vitamin, vitamin-C; providing about 29% of recommended levels per 100 g. Vitamin-C plays some important roles as anti-aging, immune function booster, wound healing, and bone growth. Further, the tuber indeed is one of the good sources of minerals such as copper, calcium, potassium, iron, manganese, and phosphorus. 100 g provides about 816 mg of potassium. Potassium is an important component of cell and body fluids which helps controlling heart rate and blood pressure by countering hypertensive effects of sodium. Copper is essential for the production of red blood cells. The body uses manganese as a co-factor for the antioxidant enzyme, superoxide dismutase. Iron is required for red blood cell formation.

### Taro

Dubbed as the potato's hairy and 'unfortunate-looking' cousin, taro is actually a culinary favourite in many cultures around world. In Hawaii, it's transformed into 'poi', a traditional dish of mashed taro roots and water, and served to guests or fed to babies. Taro chips (baked not fried), on the other hand, is becoming a popular healthy alternative to MSG-loaded processed potato chips, and can be found in many health stores today. Despite its odd and unappetizing appearance, there's actually more to taro than meets the eye. Taro is native to India and Southeast Asia, and has earned the moniker 'the potato of the tropics'. The taro is usually the size of a turnip but oblong-shaped, with a brown and fibrous (sometimes hairy) skin. The surface has circular



rings that indicate where it has been attached to the scaly leaves.

Taro root's benefits come from its rich source of nutrients, which include magnesium, iron, fibre, potassium, manganese, zinc, copper and phosphorus. It contains good amounts of antioxidants, as well as vitamins A, B6, C and E. Perhaps the most standout quality of this root crop is its high fibre content, which is said to be three times higher than that of a white potato. This is essential to your digestive health, as fibre helps add bulk to your stools, allowing them to easily pass through your digestive system. Getting enough fibre also helps prevent constipation, bloating, cramping and indigestion. Due to its outstanding nutrient profile, it's no surprise that taro – both through its root and leaves – offers health-promoting benefits, such as reduced risk of diabetes, improved vision health, healthy skin, bolstering your immunity and heart.

### Cassava (Tapioca)

Cassava (tapioca) has nearly twice the calories than that of potato, and perhaps is one of the highest value calorie foods for any tropical starch-rich tubers and roots. 100 g root provides 160 calories. Their calorie value mainly comes from sucrose which accounts for more than 69% of total sugars. Amylose (16-17%)



is another major source of complex carbohydrates. Cassava is very low in fats and protein than in cereals and pulses. Nonetheless, it has more protein than that of other tropical food sources like yam, potato, plantains, etc. Cassava carries some of the valuable B-complex group of vitamins such as folates, thiamine, pyridoxine (vitamin B-6), riboflavin, and pantothenic acid. It is one of the chief sources of some essential minerals like zinc, magnesium, copper, iron, and manganese for many inhabitants in the tropical belts. Also, it has adequate amounts of potassium (271 mg per 100g or 6% of RDA). Potassium is an important component of cell and body fluids that help regulate heart rate and blood pressure. ■

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# VERMI WHISPERS IN TINSUKIA

**A**fter a regular Soil Health Awareness Camp organised by KVK, Tinsukia in Baruaholagaon of Assam's Tinsukia district, a farmwomen named Ranjita Das requested the resource person of the KVK to arrange handful of earthworms to start her own vermicompost unit. After receiving 1 kg of earthworm from KVK Tinsukia, she multiplied the worms in a small thermocol box by adding half decomposed cow dung and banana stem. After a month, she shifted a boxful of earthworm to her newly constructed low cost vermicompost production unit and with this; dawn of a new revolution has silently started in Baruahola village.

Tinsukia district of Assam is the house of more than 28 thousand small tea growers having land holding ranging from 3 bigha to hundred bighas. Small tea growers of the district produces 20 crore kg of tea leaves per year and contributes a major part in the economy of the district. These growers are unorganized and use heavy dose of chemical fertilizers to enhance the tea leaf production as well as lot of pesticides to control pest and disease infestation. As a result, soil quality of such soil has been degrading significantly resulting in heavy reduction of tea production in this area. To restore the soil fertility of tea growing soil of the area, vermicompost is the only solution which not only supply organic matter & nutrients to the soil, but also improves the physical condition i.e. aeration and water holding capacity of the soil. For that, it is hightime to make vermicompost easily available to the tea growers for sustainable tea leaf production and most importantly to restore the soil fertility of the district.

For this KVK, Tinsukia has been working to create awareness about the production and use of vermicompost among small tea growers as well as the farming community specially farm women and rural youth of the district.



With the growing demand of Organic Farming, Vermicompost production is becoming a very profitable enterprise with very low input. The weaker sections of the society, especially women, can improve their socio-economic status by producing vermicompost commercially to fulfil the demand of the small tea growers. KVK, Tinsukia trained a few torch bearers in this run; and Ranjita Das is one of such a successful vermicompost producer and social motivator who trained another 10 farm women and housewives of her village.

Junu Begam, Najira Begam, Minara Begam are few names of Desowjan village of Tinsukia district who took training from KVK, Tinsukia on vermicompost production and have been producing vermicompost in Low cost vermicompost production units for the last 3 years. Rubul Shah, a vermicompost entrepreneur of the village helps these women to sell their products at a good price. These housewives' restless and continuous efforts gave the Desowjan village a new identity as VERMICOMPOST VILLAGE. Now, almost 12 women of the village are engaging in Vermicompost production and silently contributing to Organic movement of the district.

Similar movement is accelerating in Mohkhuli village under Bapuji Panchayat of Tinsukia district. Every household of the village is engaged with Mandhonia (Long coriander) production which has very good demand in local market. But the production has been decreasing gradually due to low fertility of land. After attending a training programme organised by KVK personal, Manjurani and her few friends of the village gathered and decided to produce vermicompost which will further help them to boost their Mandhonia cultivation by increasing the soil fertility of their farm soil. They applied their knowledge acquired in the training and by now almost 11 farmwomen of Mohkhuli village have started their production units.

With the growing importance of Vermicompost in Indian agriculture, these women are silently playing a very vital role in India's Second Green Revolution. We hope, such tiny vermicompost villages will be able to strengthen the organic movement of our country in producing healthy food by taking care of our farm soil.

**Dr. Arundhati Bordoloi, Subject Matter Specialist (Soil Science), Krishi Vigyan Kendra, Tinsukia, Assam**



# POVERTY ALLEVIATION THROUGH LIVESTOCK REARING

India has a rich heritage of rearing livestock. It is home to a number of breeds of cattle, small ruminants, fowl, pigs and equine species among others. Livestock are ubiquitous in poor communities across the developing world. An estimated two-thirds of resource-poor rural households keep some type of livestock. Livestock keeping is critical for many of the poor in the developing world, often contributing to multiple livelihood objectives and offering pathways out of poverty. Livestock keeping also affects an indispensable asset of the poor, their human capital, through its impact on their own nutrition and

health. These beliefs limit the scope of intervention programs to promote livestock and limit their potential contribution to poverty reduction. The animal-source food (ASF) has played a critical role in human development, including early contributions to the evolution of bipedal locomotion and the development of a larger brain. Later, domestication of animals and plants helped stabilize food supplies contributing energy for social development. Today, livestock are well positioned to continue contributing to social transformation as a strategic asset of poor populations.

Livestock development efforts in lower-income countries are primarily

intended to generate income and meet the growing demand for ASF. These efforts often give priority to technologies that maximize the productivity of individual animals, which may not be appropriate in the developing-country context. The livestock-keeping systems practiced by the poor have productivity per animal or land unit well below those in the industrialized countries.

There are many reasons for this pattern of lower productivity. Smallholder management systems are typically low-or no-input, letting animals forage for themselves, feeding on plants or waste that otherwise would not be used. The



poor often keep a mix of different species, trading off specialization for better protection against risks. Livestock systems of the poor reflect the resource constraints that they face (e.g., financial, access to information and services, and landlessness), as well as their varied reasons for keeping livestock.

### PRODUCING FOOD

Livestock kept by the poor can produce a regular supply of nutrient-rich ASF that provide a critical supplement and diversity to staple plant-based diets. This is particularly true for milk and eggs, which can help mitigate the effects of often large seasonal fluctuations in grain availability.

### GENERATING INCOME

In some cases, the household owns livestock for the express purpose of producing for the market. In other cases, sales may be occasional to meet an urgent need for cash, such as paying school fees or medical costs.

### PROVIDING MANURE

Livestock waste is often an important input for maintaining soil fertility, and so contributes to greater crop production for food and income. In some areas, dung is also used as a fuel. Dung for fertilizer, fuel, and building material is often a marketable commodity.

### PRODUCING POWER

In many mixed crop-livestock systems, larger animals function as farm equipment, providing traction power for transportation and crop production, and to be hired out as well.

### ENHANCING SOCIAL STATUS

Enduring cultural norms in many societies place considerable value on livestock as an indicator of social importance within the community, either based on the size of a family's livestock holdings, or in their



sharing of livestock with others, to strengthen social bonds, including the use of livestock as dowry or bride price. Higher social status may translate into access to or authority over a broader base of resources in the community. The multiple species kept by a household address these different objectives, sometimes concurrently. Thus, management does not necessarily focus on maximizing productivity from the individual animal or herd. The multiple objectives for keeping livestock suggest that it is misleading to view livestock as a conventional, independent production activity. Rather, livestock activities are integrated within household production and consumption decisions, making the role that animals play in household well-being complex. Practicing the selected livelihood strategies leads to a range of outcomes that, if successful, feed back to strengthen the household's asset base. A larger herd constitutes an increase in physical capital, and better nutrition and health derived from livestock improve human capital. The mechanisms by which livestock influence livelihood assets are those cited above as reasons for keeping livestock. It is likely that the relative importance of the various causal chains associated with beneficial and harmful effects will vary considerably depending on the specific production and market system context, and so

the net empirical impacts would vary. Nonetheless, the general pattern from the evidence reviewed suggests that livestock keeping is associated with a generally positive, although modest, impact on nutritional well-being in the household.

However, it appears that, on average, both the positive and negative influences of livestock keeping become diluted as they pass through the links along the chain. A resource-poor household may directly consume the ASF produced by its livestock holdings, but the output is so modest and infrequent, or is not fed to the household members who would benefit the most, that it becomes difficult to discern its impact.

Most often we see livestock as providers of essential food products, draught power, manure, employment, household income and export earnings. However, it is a very important fact that livestock wealth is much more equitably distributed than wealth associated with land. Thus, when we think of the goal of inclusive growth, we should not forget that from equity and livelihood perspectives, livestock rearing must be at the centre of the stage in poverty alleviation programmes.

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# ICT INITIATIVES IN INDIAN AGRICULTURE



**A**griculture is the backbone of Indian economy. It plays an important role in economic and social development of the country, where more than 65 per cent of the population is directly engaged in agriculture. Thus, overall development of a country is not possible without agriculture. For growth of agriculture, it is important

to disseminate technology to the field. There are various methods to disseminate information to the field. ICT in agriculture is an emerging field focusing on the enhancement of agricultural and rural development in India. ICT is one of the important tools which provide daily information to the farmers based on their need at proper time and place.

The application of Information and

Communication Technology (ICT) in agriculture is increasingly important. E-Agriculture is an emerging field focusing on the enhancement of agricultural and rural development through improved information and communication processes. More specifically, e-Agriculture involves the conceptualization, design, development, evaluation and application of innovative ways to

use information and communication technologies (ICT) in the rural domain, with a primary focus on agriculture. All stakeholders of agriculture production system need information and knowledge about these phases to manage them efficiently. ICTs are most natural allies to facilitate the outreach of Agricultural Extension system in the country.

Despite large, well-educated, well-trained and well-organized Agricultural extension manpower, around 60% of farmers in the country still remain un-reached, not served by any extension agency or functionary. Of the 40%, who have some access to Agricultural Information, the major sources of this information are Radio and Television. The telephone has just started to make its presence felt on this scenario. Internet supporting Information-Kiosks are also serving the farming community, in many parts of the country. Hence ICTs are highly relevant for Agricultural Extension scientists, researchers, functionaries and organizations.

The most widely used and available tools of farmers' advisory services are- telephone based Tele Advisory Services, the mobile based Agri Advisory services, television and radio based mass media programmes, web based online Agri Advisory services, video-conferencing, On-line Agri video Channel, besides traditional media like, printed literature, newspapers, and farmers exhibition/fair etc. Most of the agricultural institutes and organizations have their own telephone based advisory services for farmers. The on-line phone based expert advice service, Kisan Call Centres (KCC), launched by the Ministry of Agriculture, Government of India is available for all within the country since January 2004. A toll-free telephone number "1800-180-1551" has been provided that is operational on all days from 6.00 am to 10.00 pm. Beyond these hours the calls are attended in the Interactive Voice Response System



(IVRS) mode. The mobile based Agri Advisory services offers text, voice and video content based Agri information services through mobile phones.

ICTs can play a significant role in combating rural and urban poverty and fostering sustainable development through creating information rich societies and supporting livelihoods. If ICTs are appropriately deployed and realize the differential needs of urban and rural people, they can become powerful tools of economic, social and political empowerment.

Some useful technologies aid to understand nature of soil and its problems due to management practices. Soil quality assessment is being done with some useful technologies, through ICT intervention.

The lack of accurate and timely market information in the agri-input sector is an issue at continental, regional, national and local levels, and remains a key constraint to the development of agricultural business linkages and trade around the world. Significant progress continues to be made by public and private institutions to implement market information services using advanced information and communication technology (ICT) tools.

### Some Successful ICT initiatives in India

In India ICT applications such as Warana, Dristee, E-Chaupal, E-Seva, Lokmitra, E-Post, Gramdoot, Dyandoot, Tarahaat, Dhan, Akshaya, Honeybee, Praja were quite successful in achieving their objectives.

Krishi- Knowledge based Resources Information Systems Hub for Innovation in Agriculture, is an initiative of ICAR to bring its knowledge resources to all stakeholders at one place. This portal acts as a Centralized data repository system of ICAR. It consists of technology, data generated through the experiments/surveys, publications and learning resources.

Farm-o-pedia- The application is informative as well as can be used for daily routine. The app is useful for farmers or anyone related to agriculture. It is available in English and Gujarati language. It provides information related to suitable crops as per soil and season and weather based information to the farmers.

PGR Portal- This portal is a gateway to information on plant genetic resources conserved in the Indian National Gene bank housed at the National Bureau of Plant Genetic Resources (NBPGR). The Indian National Gene bank conserve about



0.4 million accessions belonging to about 1800 species. The information which is provided by this portal is available to farmers, researchers, students and policy makers.

**Expert system-** It is a mobile app developed for the farmers to provide information to farmers in real time on insect-pests, nutrients, weeds, nematodes and disease related problems, varieties for different ecologies, farm implements for different field and post-harvest operations.

**Pusa Krishi-** The app provide, farmers with information related to new varieties of crops developed by ICAR, resource conserving cultivation practices as well as farm machinery and its implementation.

**Direct Benefit Portal-** First phase of DBT was initiated in 43 districts and later on 78 more districts, were added in 27 schemes pertaining to scholarships, women, child and labour welfare. DBT was further expanded across the country and seven new scholarship schemes and MNREGA was brought under DBT in identified districts with higher Aadhar enrolment.

**Kisan Suvidha App-** Kisan Suvidha is an omnibus mobile app developed to help farmers by providing relevant information such as weather of current day and next 5 days, lists of available dealers, market prices, agro advisories, plant protection, IPM practices etc. Unique features like extreme weather alerts and market prices of commodity in nearest area and the maximum price in state as well as the country have been added to empower farmers in the best possible manner.

**Crop Insurance Mobile app-** This mobile app can be used to find out the complete details about the risk cover available, insurance premium under notified crops, coverage amount in case of loanee farmer.

**Agri.-Market Mobile app-** This app has been developed with the aim to provide the information on prices in the different markets to the farmers.



**Agri.-market Mobile App** can be used to get the market price of crops in the market within 50 KM of the device's location. This app automatically captures the location by using mobile GPS and fetches the market prices of crops in different markets. There is another option to get price of any market and any crop in case person does not want to use GPS location. The prevailing prices are fetched from the Agmarknet portal.

**m-Kisan Portal-** This portal is helpful to the farmers in providing the information/services to the farmers in agricultural and allied sectors through SMS in different local language.

**Farmers' Portal (One stop shop for farmers)-** Farmer's portal is an endeavour in this direction to create one stop shop for meeting all informational needs relating to agriculture, animal husbandry and fisheries sectors production, sale/storage of an Indian farmer. In farmer's

portal farmers will get information on specific subjects of their village/block/district/state. The information is given to the farmers in the form of text, SMS, audio/video and through email in their language.

**National Agricultural Market Portal-** National Agriculture Market (NAM) is a pan- India electronic trading portal that connects the existing APMC mandis to create a uniform national market platform for agricultural commodities. It's providing all the information and services through a single window system. This online platform contains information about commodity arrivals and prices. This also includes buy and sell trade offers and provision to respond to trade offers among other services. This online system reduces the transaction cost and provides uniform information related to prices.

**m-Krishi-** This app is for aquaculture operations, providing digitally enabled services on demand to the aqua farmers in the country.

**e-pashuhaar-** It is a web portal launched by the Ministry of Agriculture and Farmers welfare, Government of India, under the Department of Animal Husbandry, Dairying and Fisheries (DADF) to boost dairy productivity in India by organizing the livestock market which allows farmers and entrepreneurs find information about



bovine animals, buy or sell livestock, frozen semen and embryos. It also helps them to check information on feed and fodder and manage the transportation of animals once a purchase is made.

**Kisan Point-** Kisan point is market place for farmers and all other agricultural stakeholders. Farmers can buy/sell/lease their land, crops, natural manures, cattle, used farm machinery etc., using this e-trading platform.

**Agri Business Centres-** It provides a web based solution to the small and medium farmers as well as owners of large landholdings. It brings on a single platform all the stakeholders in agribusiness like farmers and farmer groups, institutions and autonomous bodies, agro machinery and farm equipment makers, cold chain tech., commodity brokers, cooperatives, food processors, pre and post harvest management experts, packaging technology providers, insurance companies, warehousing and logistics agencies, surveyors and certification agencies.

**e-KRISHI VIPANAN-** This initiative professionalizes and reorganizes the agriculture trading business of Mandi Board by installing cost effective digital infrastructure using latest advancement in ICT by collecting and delivering real time information online. It makes the operations more effective, totally transparent, benefiting all stake holders (farmers, traders & the government), empowering them through accurate and timely information for effective decision making.

**Query Redress Services-** It enhances livelihood promotion of farmer community through information dissemination and extension services, using ICT as tool. The project helps the farming community by making available a 10000 plus network of experts to them.

**Kisan Call Centres-** Kisan call centres have been established across the country with a view to leverage the extensive telecom infrastructure in the country to deliver extension services to the farming community. The sole objective is to make agriculture knowledge available free of cost to the farmers as and when desired. Queries related to agriculture and allied sectors are being addressed through the kisan call centres, instantly, in the local language by the experts of State departments, SAUs,

ICAR institutions etc. It provides toll free facilities to farmers on 1800 180 1551 between 06:00 AM to 10:00 PM on their own local language.

**Tata Kisan Kendra-** TCL's extension services, brought to farmers through the TKKs, use remote-sensing technology to analyze soil, inform about crop health, pest attacks and coverage of various crops predicting the final output.

**e-Choupal-** ITC's Agri Business Division's "e-Choupal " enable the agricultural community access ready information in their local language on the weather & market prices, disseminate knowledge on scientific farm practices & risk management, facilitate the sale of farm inputs (now with embedded knowledge) and purchase farm produce from the farmers' doorsteps (decision making is now information-based).

**e-Sagu-** It is an ICT based personalized agro-advisory system aimed to improve farm productivity by delivering high quality personalized (farm-specific) agro-expert advice in a timely manner to each farm at the farmer's door-steps without farmer asking a question. The advice is provided on a regular basis (typically once a week) from sowing to harvesting which reduces the cost of cultivation and increases the farm productivity as well as quality of agri-commodities.

**AKASGANGA** (Meaning "milky way" in hindi)- **AKASHGANGA's** experience indicates that even illiterate or semi-literate people can adopt IT-based systems when they see substantial benefits and when the systems are deployed in purposeful, easy-to-use ways.

Any knowledge transfer should take into account farmers' point of view, with the aim of building on their knowledge and capitalize on it. The evolutions and availability of ICT's has been the greatest communications revolution in recent years. The decreasing cost of hardware, increase in reach of communication network and availability of the same at district and below district level has opened –up huge opportunities for agricultural scientists and extension workers to reach the farming community in more focussed, precise and specific manner.

**Abhilash Singh Maurya and**

**Joginder Singh Malik**

**Department of Extension Education, CCS  
Haryana Agricultural University, Hisar**





# TREKONIK FLYING HIGH

**D**rones hovering the agricultural fields and managing the field operations at the command of a group of youngsters. A dream that led to the inception of Trekonik, a Start Up by a group of young engineering graduates based in Chalakudy, Kerala.

Launched in January 2018, Trekonik took about 4 years of joined effort in the background. "The inspiration behind this venture was a competition held at IIT Kanpur a few years back, in which some of our colleagues had participated. There they introduced to us the working and manufacturing of Drones. We



got inspired, thus we had an idea for implementing the same. At that time it seemed impossible. But the spirit to try something interesting and the urge for making new innovations energized us for doing something challenging. Not only the desire, but also the passion for this made everything possible," says Swathin Siddharth, the Founder and CEO of Trekonik. Today Trekonik community is led by a group of youngsters with Kiran Mohan, Jimmy, Swathy, Jeby Jose, Keerthana, Athul Kishore, Sujith, Maeesh, Nemin Jose and Amal Jerry manning the key positions in the company. Started initially with their own investments and from others, this ambitious



project has been short-listed by the Kerala Startup Mission for granting financial aid.

In a state where drones were mostly associated with photography, Swathin's choice of using them in agriculture was not only innovative but also adventurous. "We wanted to think beyond photography. There are lots of fields that can use the drones. We are trying to prove its advantages in all fields. Agriculture sector is most difficult sector. Once this technology get through new experiments in agriculture, then it can easily pull off in any other field. This is the reason why Trekonik got into the agriculture sector," divulges Swathin. Swathin believes in the immense potential of drones in precision agriculture. Besides using these drones for sowing of seeds, fertiliser and pesticides application, the in-built spectrum camera could help assess crop health, water deficiency, detection of plant diseases. "These drones can change the face of agriculture. These kind of technologies can also attract the new generations towards agriculture."

Beyond this apparent benefits, Swathin also points to another challenge faced by the agriculture segment, shortage of labour. Drones completely work on rechargeable batteries and hence can replace labour to a large extent. "Despite the cost of initial buying of a drone it does not require large number of labourers. Also it can work 60 times as better as a human can work, thus it efficiently reduces the manpower. A single person can handle/manage very large space. In short, 20-30 acres of land can be handled by a single person. This defines the efficiency of drones," explains Swathin. The Drone technology has already wooed the farmers in Kerala. Almost




10 farmers are awaiting drones from Trekonik.

Trekonik provides drone on rental basis to farmers for Liquid fertilizer spraying, Granular fertilizer application, Growth/disease monitoring and Seed sowing. Trekonik conducts workshops on drone technology and hands on practical classes to students. Product development, project assistance, Exhibitions, Shows, Aerial photography/videography are also other activities carried out by the group.

"Farming may be one of the next big profitable businesses in future because no one actually comes to this field and everyone in farming are still using the conventional/traditional methods. It is time to change all of these. If technologies are combined with farming effectively, it will end many challenges. We are on a mission and we hope it might change the old ways," beams Swathin. Swathin Siddharth can be reached at 7736794909, 7012751055.

**ANJANA NAIR**



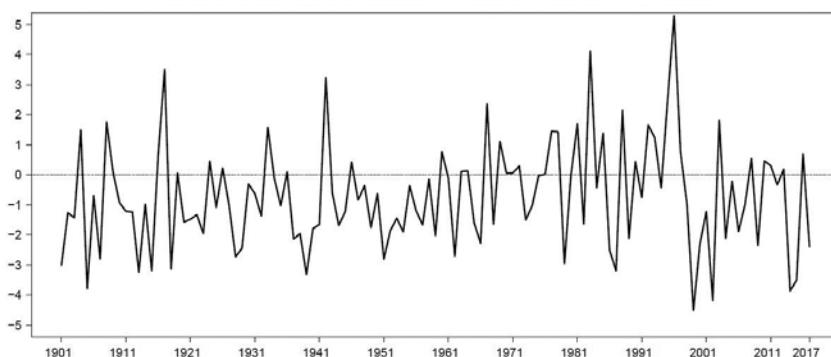


# WATER FOOT PRINT MAPPING FOR SUSTENANCE & SURVIVAL:

## THE CASE OF KHOHAR, RAJASTHAN

*Humans are the principal consumers and polluters of water. An analysis of water scarcity challenges in Haryana- Rajasthan region advocates that water security is one among the main problems that hinder economic development and food security in the area. Linking gaps arising out of the uneven distribution of water and maximising water productivity remain primary challenges to water security. Unlike carbon footprint, a global attempt to reduce water footprint has not been successful as it is itemized in time and location. Water footprint can only be an effective tool for policymakers by developing bottom-up approach or awareness building at grass root and by system based holistic development.*

### IMD JJAS Seasonal Anomaly Rainfall based on (1971-2000) Climatology - Khohar



JJAS annual rainfall anomaly from 1901 to 2017 for Khohar Village

**W**ater Foot Print (WFP) in agriculture helps one understand the amount of water consumed for agricultural purposes. It includes the water used directly, that is supplied to plant as irrigation water and the water used indirectly, the water plants absorb from soil and atmosphere. India's water footprint is 980 cubic meters per capita that positions beneath the global average of 1,243 cubic meters but its 1.2 billion people together add to a substantial 12% of the world's total water footprint. The International Water Management Institute forecasts that by 2025 in India alone, one-third population will live below "scarce water" situations.

India is one of the top cultivators and exporters of food grains and also the largest consumer of groundwater. Conventional irrigation techniques cause maximum water loss due to evaporation, drainage, percolation, water conveyance, and excess use of groundwater. As more areas come under unscientific irrigation techniques, the pressure for water available for other purposes will continue. One such water-scarce area is Khohar village (area of 5 squarekm) situated at the foothills of Aravalli bordering the states of Haryana and Rajasthan. Water is a threatening

resource in Khohar. Khohar faces arid to semi-arid climate with short spells of showers brought by the southwest monsoon. The climate of the region has been classified as semi-arid with scorching summers experiencing temperatures rising to 47°C, followed by cold winters. The potential evapotranspiration rates are quite high, especially during May and June. The IMD (India Meteorological Department) JJAS (June, July, August, September) seasonal rainfall anomaly shows a decline in trend heightened by magnified excessive groundwater exploitation by the villagers. The soil is mostly alluvial, and the village has no access to any perennial stream or canal. A seasonal stream

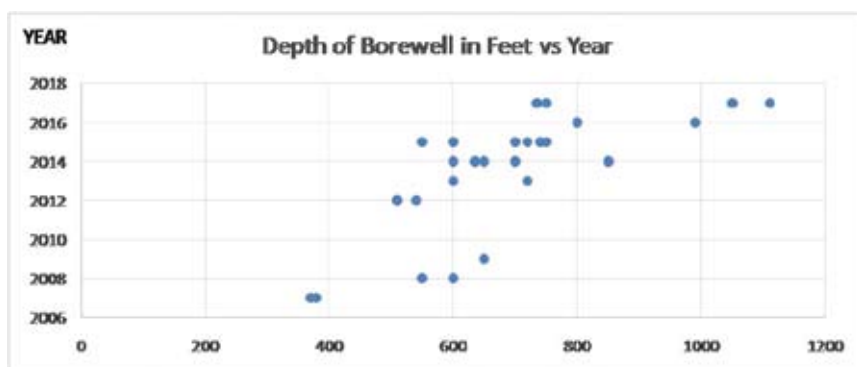
fed by the rainwater flows through the village and deposits silt in the village agricultural fields.

### Water Situation in the Village

Water scarcity is a critical problem for a monsoon-dependent country such as India, since a large part of its farm output, income, and employment emanates from a relatively small irrigated area. So is the case of Khohar where inhabitants have been traditionally migrating out of the village to earn their livelihood owing to non-remunerative nature of agriculture and ever depleting ground water. Women and children drudging to and fro for fetching water for domestic consumption is a common sight in the village. How farmers survive such water scarcity at the micro-level is as important, if not more, as is for how policy-makers' pact with it at the macro-level. Local water scarcity does motivate farmers not only to improve on-farm water-use efficiency but also to develop new approaches for inter-farm water sharing. The villagers cite that this was not something they witnessed ten years ago when the water level was 200 feet or above and it is only since the year 2000, the







*Trend in the depth of bore well from 2006 to 2018 for Khohar and Patan village*

conventional wells got replaced by tube wells and eventually turned to bore wells.

Agriculture is the primary source of lithe livelihood for more than 80 percent of the population of Khohar. The only source of water for farmers is borewells, and since time immemorial they have been extracting water from aquifers that are now firmly dry. Last year, the community bore well connected to two community tanks that provided piped water to most of the households, dried up leaving most of the villagers dependent on the individual bore well owners for their water needs from drinking to irrigation. Borewell was first

introduced in the village in the year 2005. At present, there are 13 bore wells in the village, of which around, 10/11 are functional. When a borewell was first dug in an already existing well, its initial depth was 415ft (250 ft well + 165 ft bore well). This worked for first five years and thereafter dried up. Several other bore wells were dug post-2005. Ever since 2005, there have been several instances of increasing the depth of borewells. The most recent increase in depth has been 1100 ft. Around 50% agricultural land of the village is owned by few households, who also own majority of bore wells in the village. Farmers with large landholdings are capable

of spending money on digging bore wells. Marginal farmers do not have enough funds especially considering the financial risk in digging a borewell, as the excavation may or may not yield water. The excessive cost of bore well including fuel, electricity and labour results in inequality in access thereby making space for water trade among farmers. This condition continues to aggravate the economic inequality preventing improvement of quality of life of the marginalised population in the village.

### **Agricultural Situation in the village**

Major crops grown in the village are Wheat and Mustard in Rabi season and Cotton and Bajra in Kharif season. Cotton was introduced in the village after year 2000 and became widely accepted as it is an intermediary crop permitting production of wheat in the following season. Onion is the most favoured crop of the farmers in the village as it fetches high returns. However, due to scarcity of water and onion's water-intensive nature, only those owning a bore well can cultivate onions. Though being an exhaustive water crop, wheat is preferred and widely cultivated in Khohar because of its high yield and market linkages. Mustard is another crop widely grown that requires less water and is preferably chosen by farmers who do not have means to irrigate their farms and need to buy water to irrigate.

The terms of water trade in the village involve giving a third of the total wheat production instead of five irrigations, 4000 rupees for two mustard irrigations, one-fourth of the produce for two cotton irrigations and one-fifth of the crop for seven onion irrigations. However, this is not beneficial to recipient farmers as access to purchased water is only feasible once the borewell owner has provided essential irrigation



to his/her field. This often results in untimely and scarce irrigation according to the crop cycle that diminishes the productivity of the crop, and consequently its fiscal realisation. Resultantly, the farmer enters into the vicious trap to depend on farmers having bore wells, local money lenders, banks etc. eventually forcing them to remain trapped into a liability ploy.

### Khochar's Water Foot Print and Implications

Even though, water conservation methods have been introduced into the village such as hydro infrastructures like check dam, drip irrigations and laser levelling, low rainfall coupled with an excessive area under water-intensive crop has been causing a steep decline in the groundwater levels. From 2014 to 2018, bore wells have been dug deeper than 1000 feet. Agriculture is leaving a considerable water footprint in Khochar, it poses a severe threat to agricultural sustainability. This implies that there is an urgent

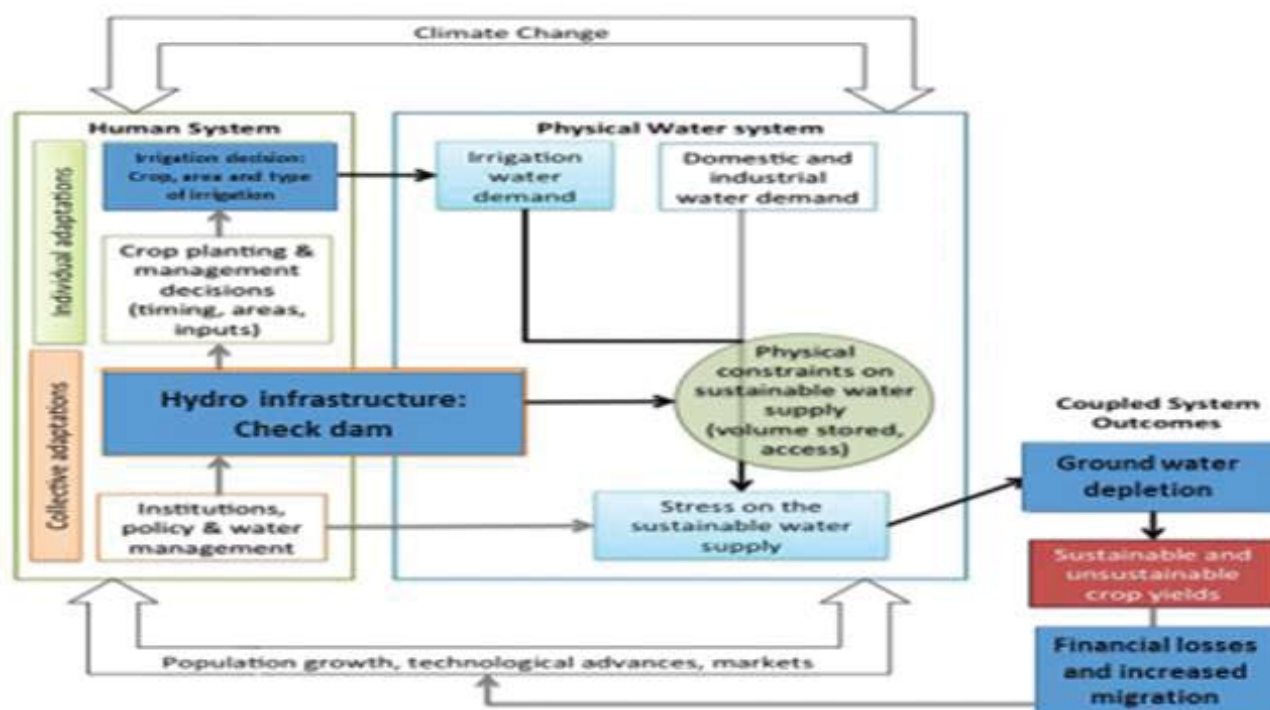


need to set a water footprint cap that sets a maximum to the water volume that can be allocated for various human purposes, accounting for environmental water needs. WFP needs to be measured as a multi-

dimensional indicator, showing water consumption volumes by sources and polluted water volume by the amount of pollution.

Low recharge along with excessive exploitation is the primary cause of rapid depletion of groundwater, therefore planned recharging of groundwater along with judicious irrigation could be a promising solution to reduce WFP. Farmers need to control their water use in keeping with what is available by altering their cropping pattern and swapping to more efficient irrigation systems. Irrigation scheduling involves managing the soil reservoir so that water is made available when the plants need it. Soil moisture and weather monitoring are used to determine when to irrigate, and soil capacity and crop type are used to determine how much water should be used during irrigation.

Climate change, population growth, technological advances, and markets (including agricultural product prices, trade, and GDP) directly impact multiple components



The conceptual framework for a coupled human-physical water system modelling of the regions' groundwater future





of both the human and physical water systems. Components within these systems respond individually to external changes, but also tend to impact each other. Check dam constructed to conserve ground water is a key component of both the systems. Individual adaptations include practices like laser levelling and installation of drip irrigation systems in the field. If adequate planning is not done at individual and group level, sustainability of the whole system will be under threat.

### **Water Foot Print Mapping, the Policy Advocacy Solution**

Precise water measurement and soil moisture checking are critical components of efficient on-farm water management practices. Irrigation flow meters can be used to help calculate the efficiency of irrigation systems, identify water loss from leaks in conveyance systems, and to accurately apply only the necessary amount of water based on soil moisture levels and weather conditions. Soil moisture monitoring is used in conjunction

with weather data and crop evapotranspiration requirements to schedule irrigation. Fields need to be designed for efficient water use by grading land with laser equipment, creating furrow dykes to conserve rainwater, and by retaining soil moisture through conservation tillage. WFP benchmarks will enable actors along supply chains – from farmers through intermediate companies to final consumers – to compare the actual WFP of products against certain reference levels. The benchmark values can be used to measure performance, to set WFP reduction targets and monitor progress in achieving these targets.

Majority farmers face credit constraints, incomplete markets, lack of information, and low levels of human capital. They have limited ability to quickly adopt new technologies or to improve upon existing ones. Now, it is used for water management decision-making. Since irrigation is a short-term adaptation response by farmers in the face of inter-annual monsoon variation, WFP calculations made

year to year helps to conserve groundwater with increased efficiency. So far, the role of water footprints in water policy has been limited to a few examples in research experiments and corporate perspectives. It is accomplished that evolution of WFP concept from elementary quantitative studies to a potent advocacy tool can aid the provision of strategy formulation, policy making and agricultural risk awareness for sustainable water use. WFP raises a lot of questions about the sustainability of water use in agriculture. Solving these questions will be the most significant challenge for policymakers. It's time that we take cognizance of the truth of Khohar being waterless, and take steps to make people aware, fix infrastructural issues, harvest rainwater, reclaim bore wells, and endorse concepts for making the best use of prevailing water supplies.

**Aparna Radhakrishnan; Niti Saxena and Prateek Aggarwal**  
S M Sehgal Foundation

# WITHER WEATHER ...A FARMER'S ANGUISH!

**T**hese days almost everyone is looking at the weather reports. Deliberately or by default, for it nudges inbetween the often watched episodes over the electronic media. Then there is also a lot of it in the print media.

Weather and Climate is also almost a daily chat, awareness at schools, subject of serious discussions amongst State and so many others at various forums and often at huge levels at centre stage.

5th June 2018, just gone by and made to be World Environment Day, reinforces the significance of Weather and Climate which is in very complex dynamics with Environment and vice versa.

And yet there is an inexplicable strange feel about such, for it seems to suggest that we humans are not an intrinsic part of the whole environment and are but bystanders and watching helpless at a distance....perhaps even thinking that as individuals there is no role for one to play and there never ever was !

Is there a possibility that such knowingly or otherwise unconcern

is reflected in apathy towards our farmers and hence their plight and distress. For the farmer, weather, environment and all its dynamics are crucial as is Life. Hits one hard on Environment Day, when the cascading effects remain closeted. Amidst all the mention of weather and environment, the farmer remains the central figure but unseen and undisclosed.

Now the farmer who pursues the riskiest calling in the world faces vagaries of nature entirely on his own. His calling does never afford a fixed monthly remuneration, come what may to have him meet his expenses for living as in case of most of us. All the while, there is a kind of tension within as to how the harvest will turn out to be and how each component of the weather: rain, temperatures, length of day, light, humidity, night temperatures would bear upon his patch of land. Even if all goes well, as a producer there is little control over the price that would be gotten.

Would the input cost be recovered? And which possibly as a standard help or political patronage he could have received from State and other agencies but has to some extent be

paid back. Could he have done without such for the consequences of such justifiable intentions have started to starkly tell on his land and soil health, leading to increased application of chemicals (and which in turn help no one....least the consumer.) Furtherance of industrial agriculture which most small farmers are unable to manage the devious mechanism.

Also, the usual household expenses that are unavoidable. Thus all our sensibilities towards farmers need be heightened so we are aware of the fact that in a Country, where farming is so heavily rain dependent, the weather and environment are so so inextricably linked to a farmer's smile and woes.

This is apt for all agri businesses which flourish around a beleaguered, yet largely poor and not very literate farmer who struggles to make ends meet and yet persists in efforts, with an "always glance" at the sky as if to gauge what's in it coming for him.

That most do not take to farming is seen clearly as the risks it entails are huge and cannot be algorithmically resolved. The political solutions are rhetorically populist. There is often a mention of a vicious cycle " in which the poor farmer is trapped. Now the need is to try to perpetuate a "virtuous cycle".

Could a climate of respect and understanding of a farmer's standing raise their sentiments and bolster hope as the slogan of our Late Prime Minister, Lal Bahadur Shastri echoed... Jai Jawan Jai Kisan !

Perhaps such enthusiasm can help if generally the people listen to outside of their own echo chambers. Sometime.....??? ■



**Ashok Trivedi**  
Tea Farmer





“Loan waivers are not a permanent solution. In long-term, it will affect the agriculture sector and hurt the farmers. As a huge population is dependent on agriculture for livelihood, increasing the income and the purchasing power of this group is extremely important”

**VENKAIAH NAIDU**  
Vice President



“A climate risk management strategy will have to be developed in consultation with farmers for every major agro-ecological region. We should be prepared to benefit from good monsoon and minimise the damage from erratic monsoon through obligatory rainwater harvesting and conservation procedures. India has made good progress in reducing monsoon dependence. But there is scope for much more action”

**DR. MS SWAMINATHAN**  
Renowned Agriculture scientist



“There is no doubt that farmers are in distress because their cost of production is going up, quality of their land is becoming poorer, they keep adding more and more chemical nutrients. They (farmers) are not diversifying from land-intensive crops to more high-value yielding crops. Also, there is limited access to the final market despite the government’s effort to bring in e NAM or abolish APMC”

**RAJIV KUMAR**  
Vice-Chairman, NITI Aayog



“Farmers can conserve their energy and use it in enhancing the productivity and augmenting their income, if they go for a voluntary consolidation of their scattered landholdings by exchanging it with other farmers, as per their convenience”

**TRIVENDRA SINGH RAWAT**  
Uttarakhand Chief Minister