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CROP PROTECTION KEY TO FOOD SECURITY



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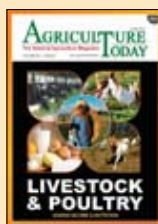
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From the Editor's Desk**PROTECTING CROPS - THE PRIORITY**

Damage to crops by biotic elements is universal. On an average, 20-30% of food produced is destroyed by the incidence of pests and diseases in India which translates to around Rs. 45000 crore loss for the farmers. Changing climates have resulted in new pests and diseases and aggravation of minor pests. Regularity in their occurrences have warranted an in-built regime of crop protection measures that focusses more on prevention and containment.

Although efficacy of plant protection chemicals are undisputed, their continuous and indiscriminate use have far outweighed their benefits and brought the side effects to the center stage. The result was the adoption of integrated pest and disease management wherein chemical means of pest management became one of the many components. If we compare with other countries, India's spend on crop protection chemicals is \$2.5 billion, which is just 0.8 per cent of the total agrarian production.

Chemicals have today become synonymous with plant disease management, although there exists a wide array of crop protection measures. Resistance is the first line of defense against invading pathogens and pests. Other than the conventional breeding, genetic engineering has also yielded excellent outcomes. Plant disease forecasting is an underexploited area in India. Pest and diseases are dependent on weather variables to a great extent and many models have been developed to predict the onset of diseases and pests. However, those models are seldom used in conventional agriculture. But in years to come, model based predictions would find favour in agriculture. Biopesticides and biocontrol agents present another dimension of crop protection. This assumes significance considering the resolve of many states in India to go completely organic. Nanotechnology is a fascinating and rapidly advancing science and has the potential to revolutionize many disciplines of science, technology, medicine and agriculture.

Pest and disease dynamics are constantly changing and so it becomes incumbent upon the industry to cater to the evolving demands. The sector therefore is in the cusp of constantly changing technologies to suit the varied demands and R&D thus becomes a priority. But higher cost on R&D deters many manufacturers from investing in new solutions. Farmers at large remain unaware of the new products or they lack the knowledge regarding a product at hand. This is a precarious situation as the efficacy or the usefulness of the product is closely linked to the knowledge of the user. Lack of education and awareness among farmers is counted as one of the main reasons behind failing efficacies of the crop protection product or their misuse. The threat of spurious products is real and their use by the gullible farmers have questioned many times the reliability of plant protection products.

Although crop protection measures figure only towards the end of any package of practices, they ultimately determine the health and quantity of the harvest. Investing in appropriate crop protection measures is hence a very wise and prudent way of ensuring successful agriculture.



Anjana
Anjana Nair

CONTENTS

VOLUME XXII | ISSUE 7 | JULY 2019



Cover Feature

CROP PROTECTION: KEY TO FOOD SECURITY



Sustainability

BAMBOO RESOURCES FOR ECOLOGICAL SECURITY

Editorial	03
Editorial Comments	06
News Corner	10

Cover Feature

Crop Protection: Key to Food Security	22
Position Paper on Fall Armyworm	36

Opinion

An equitable water use policy for India	40
---	----

Sustainability

Bamboo Resources for Ecological Security	42
--	----

My Page

Food Front for India: Towards poverty reduction and attaining agrarian prosperity in India	46
--	----



Innovation

Edible Packaging	48
------------------	----

Agri Education

Rural Management providing opportunities beyond agriculture	52
---	----

Food Entrepreneurship

Salem RR Biryani - Food For All	54
Different Strokes	58

Presents

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Addressing Agriculture

The new government will have their hands full on addressing challenges in the farm sector

Agrarian distress and the disarray in the agriculture segment would take up a big share of the concerns of the newly elected government. It was the same government that braved the ill-will of the farming community during their previous tenure. It will also be interesting to see what the budget has in store for agriculture as the due date to deliver on doubling farmers' income, 2022, falls well within the tenure of this government. So far, there has been no respite in the situation of farmers, as farming has increasingly turned economically less remunerative and unpredictable.

In the last few years, India has witnessed many climate induced anomalies. From cyclones to flooding to drought, agriculture has borne the brunt of the climate and so have the farmers. Today the biggest threat to the crops planted is the climate itself. Erratic weather phenomena and incompetency in dealing with this have damaged large areas of farms. Serious initiatives must be taken to climate proof agriculture. Assuring irrigation through parched seasons by conventional and non-conventional methods can drought proof perennially dry regions. So also, investing in flood tolerant or drought resistant varieties. A programme must be envisioned that enumerate the ways to climate proof agriculture, and budget allocation towards the same could further reiterate the relevance of climate change.

With the government's focus on the agriculture sector to double farmer's income by 2022, it would be the right time to persuade the states to enact the model Agriculture Produce Marketing Committee (APMC) Act drafted years ago. The objective of the model Act is to keep fruits and vegetables out of purview of the mandis, abolition of Aartha commission and permission for hassle free inter-state trade. While some states followed the act, others have not. As more states join the act, farmers in the state can find more markets and better profits. Also, the government might have to take a policy decision whether to abolish the Essential Commodities Act

(ECA), a tool used to prevent hoarding and price rise. The ambiguity and open-ended policy to invoke it anytime on any commodity, dissuades traders from buying agricultural commodities beyond a point which depresses the mandi prices, and is one of the factors of farm distress.

One of the biggest problems that the farmers have encountered in the last few years is bumper production. Without proper means of storing the harvest in a healthy condition, all that the farmers could do, is to sell their produce at depressed prices. The next budget should focus on building warehouses and granaries. Cold storage and cold transport are also important. Public private partnership route can be availed to maximize their presence and upkeep. Food processing to a large extent can also address the problem of excesses. Promoting food processing can increase demand, shelf life of excess produce and thereby income of farmers. Farm exports can be promoted and the taxation issues have to be resolved.

Keeping 'Increasing farm incomes' as a central strategy, farmers have to be encouraged to diversify their income basket. Besides their key crops, small and marginal farmers should be encouraged to take up allied farm activities like animal husbandry, fishery or poultry. Recycling their farm waste into more productive options and increasing the profitability of the farm as a whole must be the key. Stubble burning which has become a recurrent phenomenon must be dealt with an iron hand this time. Farm waste management should be made a priority.

The budget should make generous allocation for research in the country. Agriculture progress is contiguous upon research and extension. So far the allocations made to this area have been far from satisfactory. The government should this time take an unambiguous stand on GM technology. The authorities cannot ignore this powerful technology and fall prey for populist agenda. These varieties are well equipped to survive the new challenges of pest and diseases.

Agriculture is going through a difficult phase. Hopefully the new government will address the challenges and realize their vision of doubling farm incomes.

Seeds of Discontent

Farmers defy ban on GM crops by sowing them

Seeds of discontent were sown in Maharashtra when Shetkari Sanghatana, a farmers' body sowed seeds of banned genetically modified Herbicide-tolerant cotton in a village in Akola district. As a mark of protest against the government's ban on Genetically Modified (GM) crops, in the presence of around 1,500 farmers, India saw the "Civil Disobedience" programme, under the Sanghatana that had put out saffron and green posters that proclaimed "Freedom of technology is our birthright" and announced its intention to defy the ban on Bt brinjal and HT cotton.

When Bt crops made a landfall in India back in 2002, there wasn't much resistance or protest. The crops of genetically modified cotton was welcomed and as a result India became the world's biggest cotton producer and now has the fifth largest area under GM crop cultivation. Bt cotton seeds account for 40% of the Rs 14,000 crore national seeds market. For a decade or so, Bt cotton was the only GM crop that India cultivated. The scope of the technology was too wide to limit it to just a field crop. Research on other crops on full swing, India imposed a moratorium on another Bt crop in tow, Bt Brinjal. Since then all the GM crops have hit a roadblock. After hitting a record high in 2014, cotton yields and output in India have declined as Bollgard II lost its effectiveness against bollworms. To maintain its position as the world's top cotton producer, India needs to introduce Monsanto's next-generation Bollgard III. However, the current impasse over the GM technology in India, has stalled its adoption.

The farmers in India have experienced the benefits of GM technology, although the outputs have not remained stable. But which crop varieties have been consistent in terms of output and resistance to biotic and abiotic stresses? With years of exposure to the elements of stress, the resistance towards it would wear off. It is nature's course

and it has happened over the years with species and varieties. The fittest have survived. Technologies are thus evolved to counter newer threats, newer challenges. If they are stopped midway, the result will be disastrous. Alienating farmers from new technology, once they were given the taste of its benefits, is cruel and unkind.

However, with the involvement of private entities in the research and development of controversial technologies like that of GM, profit motives can grow stronger and ethics may become a flimsy collateral. So we have regulatory authorities like Genetic Engineering Appraisal Committee (GEAC) in India, which places checks and balances in to the system. Unfortunately, their competency have often been questioned and their efficacy has been put to trial by rampant discoveries of illegal cultivation of banned varieties of crops.

But banning the technology for the incompetency of the regulator is irrational and illogical. Instead, what India needs is a better regulator and not abstinence from technology. These are challenging times for agriculture. Diminishing resources, hostile environment and risky markets have debilitated India's farming community. If the government needs to deliver on its promise of doubling farmers' income, India needs to invest in appropriate technology. Blaming the inability of the authorities is not a good enough reason to plunge the country's agriculture into dark ages, which is a lifeline of more than half of the population of the country.

Today what India needs is not a lifetime ban of any technology, but a cloudburst of technology. We need varieties that mature faster, stores longer, tastes better, nourishes better, resist biotic and abiotic stresses. Imbibing the latest tools in science and technology can help us achieve this better. Until then we will have disobediences, protest and defiance.

Cashew sector pulls back

Hike in MIP is expected to incentivize cashew industry

The decision to hike the minimum import price (MIP) for whole and broken cashew was an intervention that was long overdue. The decision to hike the minimum import price of broken cashew kernels by nearly 138 per cent and whole kernels by 280 per cent will augur well for the strained cashew industry. Struggling with cheaper imports, the cashew industry in India was in shambles stifling its lucrative growth prospects.

Once a major exporter of cashew by contributing 60% to the global trade, India has now emaciated into a major importer to keep up with its processing demands. The Indian production of cashew nut for the year 2016-17 was 7.79 lakh million tonnes which is not sufficient to run the processing factories having a processing capacity of 17 lakh MT per annum. India has thus endured imports of low-quality cashew kernel shipments from Africa and ASEAN countries that had hit the domestic industry. While the origin countries impose taxes on export of raw cashew, they incentivise kernel exports. This has resulted in dumping of cheap and low-quality kernels from countries like Vietnam, Mozambique and Ivory Coast. The situation has worsened to a considerable extent as many cashew processing units are closing down. For instance in Kerala, which accounted for 85% of the country's cashew production, more than 700 out of the 865 cashew processing factories, have already been closed, and as a result nearly 2.5 lakh cashew workers have been rendered jobless.

The existing MIP was too insignificant. Having been introduced in 2013 at the then market price, MIP did not follow suit of the increasing market prices which shot up to 2-2.5 times, touching Rs700-Rs800/kg for whole cashew and Rs650-Rs700 for broken cashew. Some importers taking refuge under various FTAs shipped large volumes of plain cashew kernels (mostly broken) of inferior quality. The absence of a domestic market was

also the reason for the origin countries to sell their products in the Indian market at throwaway prices. These countries with 20-25 per cent incentives exported finished and semi-finished kernels. Taking advantage of this, they dumped kernels in the Indian market as they have an advantage of 45 per cent of the costing compared to domestic processing. Besides, there were instances of wrong declaration on cashew kernel imports as roasted cashew and animal feeds. India was the victim of shoddy policies that were twisted to accommodate the interest of profit seeking importers.

The hike in MIP will surely revive the domestic cashew processing sector and thereby assure job and livelihood for many workers. However, the Indian cashew industry's problems will not be solved by enhancing the MIP alone. We should address our inherent challenges. Indian cashew sector depends on manual labour and as a result the cost of production has increased considerably almost five times as much as in Vietnam. Vietnam's automated processing units produced cheaper processed cashew in huge quantities. Bringing in automation in the processing sector can enhance our competitiveness, bring in sustenance and stability. Besides, India can reduce its dependence on imports and encourage extending cashew plantations to other suitable regions. Sick plantations can be revived and replaced with high yielding varieties. Automation is a crucial factor that determines the profitability of the sector. A suitable package for rehabilitation of the displaced cashew workers is also warranted. Exploring the possibility of enrolling cashew workers under the National Rural Employment scheme is a good option.

Indian cashew commands a premium position abroad on account of its quality. With cheaper imports we are ruining a bright prospect. Although MIP hike was a good intervention, the cashew industry itself has to rein in many reforms if it has to remain competitive.

Maharashtra's dipping Agriculture growth

Economic Survey indicates a dip in agriculture growth

Confirming the worst fears, the state Economic survey endorsed the continuing agrarian distress in Maharashtra. Stating consecutively declining state agriculture growth over four years, annual Economic Survey report has pegged growth in the agriculture sector at just 0.4 per cent for 2018-19.

Advance estimates for 2018-19 in the Economic Survey tabled in the Maharashtra House showed that real GSVA (Gross State Value Added, at basic prices) in Maharashtra's crop sector is actually pegged to register an 8 per cent decline. The real GSVA of the overall 'agriculture and allied activities' sector will record a 0.4 per cent growth, the Survey stated, in comparison to 2017-18 on account of the 13.9 per cent growth in livestock, 16.4 per cent growth in forestry/logging and a 3.4 per cent growth in fishing/aquaculture. The 8 per cent dip in value in the crop sector is the worst since 2014-15, also a drought year, when it fell 16.7 per cent compared to the previous year. In 2015-16, growth in GSVA in the crop sector was a negative 7.6 per cent. In 2016-17 and 2017-18, GSVA growth rate in crops was 25.2 per cent and 0.8 per cent respectively.

The findings of Economic survey are worrying especially since, fifty-three per cent of Maharashtra's population rely on this sector for their livelihood. Poor growth in this sector means putting at stake the marginal sections of the society under further stress. Since the last few years, farmers in Maharashtra has been consistently highlighting their plight and the Economic survey has confirmed their assertions. The decline in agriculture squarely points to poor returns from agriculture. Last year Maharashtra received 73% rain during the year, and rabi crop output, which accounts for roughly one-fourth of total output, was hence estimated to be 65% lower. This suggests a poor irrigation infrastructure in the state and it is surprising, considering the regularity with which the state passes through the drought

phases. With not even a quarter of the state served by an irrigation network, and with over 70 per cent of the state's geographical area lying in a semi-arid region, poor performance in the agriculture sector is the direct derivative of water scarcity. With a failure of the 'departing monsoon' as the September-October rainfall is called, the area under rabi crops fell by about 50 per cent in 2018-19 compared to the previous year.

A perusal of the report reveals that among crops that were rainfed, fared poorly. In 2018, production of cereals went down by 35%, while pulses production declined by 6%. However, the crops under irrigated areas have shown a positive growth. Oilseeds, cotton and sugar cane production has gone up by 16%, 17% and 10% respectively this year in Kharif season. Despite the drought, land under sugar cane plantation as well as production has increased this year. Sowing of rabi crop declined by 50% due to deficient rainfall in September and October of last year. The area under cereals, pulses and oilseeds during the rabi sowing season decreased by 56%, 40% and 58% respectively.

More than 800 farmers have committed suicide in Maharashtra upto April this year. Almost 12,000 farmers committed suicide between 2015 and the end of 2018 in the state, the highest in India. The prime issues leading farmers to take this extreme step is mostly related to debt and drought. Almost 25,000 villages in the state are suffering due to a serious water crisis, according to the state government data.

This clearly points to the mismanagement of water resources and inability of the government machinery in either expediting irrigation works or introducing new irrigation projects. The state clearly needs to invest in wise water management. Policies that are founded on water conservation and resuscitation of water bodies are the only means by which the state can be assured of better farming prospects.

Bayer banks on new products

➤ Crop science major Bayer CropScience is banking on a new business model for growth as it sees India's agriculture economy being stressed in the near term, and also as the company's bottom line has taken a hit due to a weak Rabi season. Now, it is implementing a new business model and launching new products to improve sales and profits. D Narain, vice-chairman, managing director and chief executive officer (CEO) of Bayer CropScience, said: "Adverse weather and drought led to a weaker-than-expected Rabi season. Overall crop economics will remain stressed in the near term and we are convinced about the long-term potential of the market." The company incurred a loss of Rs 79.8 crore in the March quarter on revenues of Rs 128.8 crore. For the entire fy19, the Bayer arm's revenue was Rs 2,685.7 crore, up from Rs 2,749 crore in the previous financial year. The company logged a profit of Rs 237.6 crore in FY19, a decline of 20.8 per cent from Rs 300 crore in FY18. Bayer CropScience is banking on new initiative wherein company has focused on working with several small holder farmers and partners including International Finance Corporation to develop value chain and entrepreneurship opportunities for many people. Bayer has launched Aqua K-Othrine, a new product in the vector control segment under its environmental science business. This is the company's first launch in twenty years in the Indian vector control market. Aqua K-Othrine is a water-based insecticide that cuts costs by 80 per cent. Most products in this segment use oil-based diluents such as diesel. When asked about Bayer and Monsanto's merger in India, Narain said: "Our focus will be on product innovation, digitalisation and partnerships. Based on the anticipated completion of the merger in India, we envisage new market opportunities and operational synergies from the integration with Monsanto."

Corporate tea sector seeks MSP

➤ Tea plantations in the corporate sector have sought a minimum support price or a minimum auction price for the commodity as was done in the case of cereals and pulses. Even though the price of green leaf is monitored and controlled by the Tea Board, there is no mechanism to support the tea manufacturers from the vagaries of price fluctuations. Hence an MSP will help the sector that provides livelihood to thousands of workers, they said. "We have already taken up the matter through industry bodies such as United Planters Association of South India (Upasi) and Association of Planters of Kerala (APK). Corporate plantations deserve the benefit of MSP, considering the unstable price situation prevailing in the sector," an official source in the sector said. It is pointed out that the unorganised sector in the tea industry is largely free of statutory social costs such as PF, accommodation, sanitation, medical and child care etc, while the corporate sector has to meet all such requirements. The government should bear a portion of the social cost to help the corporate plantations to tide over the situation in the wake of declining prices, sources added. It is an accepted fact that the climate change is a reality and mitigation measures are an inevitability. However, no comprehensive programme-based approach has been initiated in the plantation sector. Individual plantations have been left to address the issue depending on their financial might. The Tea Board should extend support to tea plantations for conservation of soil, water, natural flora and fauna, the sources said. The sector also suggested formulation of a comprehensive plan with adequate financial support for improving the social amenities. As tea plantations in South India are under heavy financial burden, the Centre should reimburse the social costs to the tea estates through the Tea Board, they said.

Farm-focused Pioneering Ventures opens Rural India Impact Fund

➤ Agri-focused accelerator and investor Pioneering Ventures has launched its Rural India Impact Fund, a private equity fund with a targeted corpus of \$70 million, to provide growth capital exclusively to companies it has backed so far. The Mumbai and Zurich-based investor has incubated five companies — Desai Fruits & Vegetables, Citrus International, FarmLink, MilkLane and Samaaru — in the agriculture, agri-supply chain and farmer credit space. "The fund went live recently as a private equity fund that exclusively invests in Pioneering Ventures' (PV's) businesses. The plan is to, over the next two years, build the fund to around \$70 million and to use all the proceeds into PV's five business," said Martin Wittwer, executive partner for operations at Pioneering Ventures. The limited partners for the new fund are largely European HNIs and family funds who have invested in the five businesses alongside Pioneering Ventures. The investor said the fund was necessary as four of the companies were now ready for their next stage of growth. Pioneering Ventures said the combined revenues of its five companies will be around \$100 million this year and expects this to grow to \$300 million in the next two years. The new fund will largely look at fulfilling the capital expenditure that these startups will need to make to sustain the threefold growth.

Not in default, will pare debt by Rs 2,000 crore, says Jain Irrigation

▶ Asserting that the company has not defaulted on any of its debt obligations, Jain Irrigation said it is confident of executing its plan to bring down its debt by Rs 2,000 crore through corporate action. The Jalgoan-based company has a debt equity ratio of 1:1.1, and networth of Rs 4,561 crore including compulsory convertible debentures, it said in a regulatory filing. "To address the unsubstantiated rumours in the market and queries from various investor groups, we wish to state that the company has not defaulted on any of its debt obligations," Jain Irrigation said. Post the board meeting on May 30, the company had intimated its decision to reduce the debt by Rs 2,000 crore through corporate action. "The company is confident of executing on these plans," Jain Irrigation said, adding that all operations of the company are ongoing. As on April 1, the company had more than Rs 5,000-crore orders in hand. It has total 33 manufacturing plants worldwide and 12,000 associates, it added. Stating that the company is "growth oriented, profit-making and dividend paying entity", Jain Irrigation said its net profit stood at Rs 239 crore and revenues at about Rs 8,600 crore during the 2018-19 fiscal. The company's adjusted EBIDTA was around Rs 1,250 crore after adjusting for one-time costs and forex/translation costs, it said. Jain Irrigation is into manufacturing of micro-irrigation systems, PVC and HDPE pipes, plastic sheets, agro-processed products, renewable energy solutions, tissue culture plants, and other agricultural inputs.



Kanan Devan ventures into modern retailing

▶ Eyeing additional revenues, Kanan Devan Hills Plantations Company (KDHP) has embarked on a new retail initiative – Ripple Tea Chai Bazar. KDHP has converted its over-the-counter model into a modern retail format on a pilot basis in Munnar town. This outlet, which sells Munnar high-grown regular and super speciality teas and other value-added products on the tourist highway in the hill station, fetched a sales revenue of Rs 20 crore in FY19. Buoyed by its success, four more such plantations stores were opened in the past 18 months and the company has set a sales revenue target of Rs 35 crore for the current fiscal, said Mathew Abraham,



Managing Director and CEO of KDHP. "It is a unique concept to showcase Munnar teas that could match with best of the teas in the world," Abraham said, adding that the company is exploring opportunities to open more such plantation stores in other parts of Kerala and Tamil Nadu. Super speciality teas such as White Tea, Rose Petal teas, flavoured and ice teas are the most sought after products. Besides providing freshly brewed teas under Ripple brand, these outlets offer free parking facilities and modern and clean rest-room facilities. KDHP has an essential oil and fragrance extraction unit. The aromatic section in these stores sells a range of oils such as Tea Tree oil, Eucalyptus, Lemon grass, Citriodora, Vetiver, Geranium. The chocolate making unit in Maduppatty supplies 16 varieties of specialitychocos.

MoU signed to control threat of fall armyworm

▶ For controlling the growing threat of fall armyworm (FAW) in Maharashtra, which can reduce the yield of crops such as maize by 10 to 50 per cent, Panjabrao Deshmukh Agriculture University has entered into a Memorandum of Understanding with agri-chemical major UPL Ltd. Vice-Chancellor VM Bhale said that the University along with UPL Ltd will be carrying out a pesticide control programme over 100 acres in the Buldhana district. The technical guidance will be provided by the University, he said.

MCF plant resumes production

▶ Mangalore Chemicals and Fertilizers (MCF) Ltd, which was forced to shut down some of its units following water scarcity in Mangaluru in mid-May, commenced the production of ammonia, urea and ammonium bi-carbonate (ABC) units. The company informed the stock exchanges that the ammonia, urea and ABC production commenced from June 12 in view of the onset of monsoon and normalisation of water supply to the plant. Mangalore City Corporation, which supplies water to the MCF plant, had reduced the supply of water from May 14 following the depletion of reservoir level at Thumbe vented dam near Mangaluru. The reservoir also supplies drinking water to Mangaluru city.



Govt to procure 4 lakh tonnes of pulses to create 16-l-t buffer stock

► The government plans to procure an additional 4 lakh tonnes of pulses from farmers in the coming weeks as it plans to increase the buffer stock to 16 lakh tonnes, officials said as Consumer Affairs and Public Distribution Minister Ram Vilas Paswan and his deputy, Danve Raosaheb Dadarao. "Since 2016, we have been maintaining a pulses buffer stock of 20 lakh tonnes which is now successfully liquidated, without any wastage. This has helped us maintain the prices of pulses within limits. Now that this has been disposed of, we are building a new buffer stock of pulses in order to ensure that the prices are under check. We have already procured 12 lakh tonnes. An additional 4 lakh tonnes will be procured very soon," Consumer Affairs Secretary Avinash K Srivastava said. He said the Department is also planning to keep a buffer stock of at least 50,000 tonnes of onions as the prices of the bulbs tend to fluctuate even during the season. According to Srivastava, as the government is promoting contract farming in a big way, the Department plans to remove stock limits on different produce produced under this format; caps were imposed under the Essential Commodities Act. Giving an outline of the work to be carried out by the Department during the first 100 days of the new Modi government, he said there are six quality control orders for 11 products, these would be brought under compulsory certification schemes. Efforts are also being made to get international recognition to the certification by the Bureau of Indian Standards so that products made in India need not get a fresh certification from other countries when they are exported, he said.



Govt extends PM-KISAN scheme

► Delivering its poll promise, the Centre notified a decision to extend the benefit of Rs 6,000 per year under the PM-KISAN scheme to all 14.5 crore farmers, irrespective of the size of their landholding, in the country. A decision in this regard was taken in the first Cabinet meeting of the new NDA Government on May 31. In its manifesto for 2019 general elections, the BJP had promised to extend the scheme to all farmers. Notifying the decision, the Union Agriculture Ministry has written to all State Governments, asking them to identify beneficiaries subject to the "existing exclusion factors". Those excluded from Pradhan Mantri Kisan Samman Siddhi (PM-KISAN) include institutional land holders, farmer families holding Constitutional posts, serving or retired officers and employees of State/Central Governments as well as PSUs and government autonomous bodies. Professionals like doctors, engineers and lawyers as well as retired pensioners with a monthly pension of over Rs 10,000 and those who paid income tax in the last assessment year — are also kept out of the ambit of the scheme. The Rs 75,000-crore PM-KISAN scheme was announced in the interim budget, under which the Government decided to provide Rs 6,000 per year (in three equal installments) to an estimated 12.5 crore small and marginal farmers holding land up to 2 hectares. The revised scheme envisages to cover two crore more farmers with an estimated expenditure of Rs 87,217.50 crore in the 2019-20 fiscal. The Centre has also asked State Governments to use "the existing land ownership system" to identify beneficiaries and transfer the benefit after the family details are uploaded on the PM-KISAN portal.

Paswan rolls out Rs 6k-cr plan to build silos, fights shy of DBT

► The Food Corporation of India (FCI) will have modern silos with carrying capacity of 100 lakh tonne by 2022-23, up from less than 7 lakh tonne now, food and consumer affairs minister Ram Vilas Paswan said. The silos project will require capital investment to the tune of Rs 6,000 crore. While the move will help reduce carrying cost of grains — a staggering Rs 25,000 crore annually at last count — and reduce the storage losses, it is barely radical reform. The government's food subsidy bill — budgeted at Rs 1.84 lakh crore for FY20 — would come down by close to a third if the current public procurement+distribution system is replaced with more cost-effective alternatives such as direct cash transfers (DBT) and food stamps/vouchers/coupons. Thanks to the procurement system, FCI and other agencies hold extra stocks (over and above the buffer required) in most parts of the year. These agencies among them were holding excess food grain stocks worth Rs 1.18 lakh crore (economic cost) on April 1, 2019, in the 'central pool.' This was even as fiscally-stressed Centre's food subsidy dues to FCI were close to a staggering Rs 2 lakh crore at the start of this fiscal. For the third year in a row, FCI had to force the corporation to tap the National Small Savings Fund (NSSF) loan. FCI borrowed an additional Rs 60,000 crore from the NSSF in April 2019 to ensure its operations under the National Food Security Act are not disrupted. Currently, under the National Food Security Act, over 80 crore people get 5 kg of wheat/rice every month at a highly subsidised rate of Rs 2-3/kg. Sources said the government is also planning to offload about 8-9 million tonne (mt) of food grains from the surplus stocks to provide additional up to 2 kg of rice or wheat to the population covered under NFSA for the next six months. This could inflate the annual subsidy bill by some Rs 25,000 crore.



As prices spike, govt moves to improve supply of onion, arhar

► The government removed incentives for export of fresh and chilled onions and decided to double the import limit of arhar to 4 lakh tonne by October end to improve supply of the key kitchen items in the domestic market. A high-level panel under Union consumer affairs minister Ram Vilas Paswan also decided to release 2 lakh tonnes of arhar dal from its buffer stock in the market to narrow the demand-supply gap. Price of arhar dal has increased by Rs 7-8 per kg in the past one month. Similarly, the wholesale price of onion at Lasalgaon in Maharashtra have shot up by about 48% to Rs 13.3 per kg as compared to Rs 9 per kg a month back. Paswan said till now the limit on import of arhar dal was only 2 lakh tonne. "We have increased the import limit considering that there could be about 5 lakh tonne less production of arhar this year as compared to last year. We have 7.5 lakh tonne stock of arhar. So, there will be no shortage to meet the demand. We have taken all these decisions to ensure that the traders and middlemen are prevented from exploiting the situation. Arhar from buffer stock will be released at no profit no loss basis," Paswan said. He added India will also receive 1.75 lakh tonnes of arhar dal from Mozambique during the year. According to official data, there is no issue so far with any other pulses since the production would match figures for last year.

Govt considering rolling out 2nd phase of fertiliser DBT

► The government is seriously thinking of giving fertiliser subsidy directly to farmers under the second phase of implementation of direct benefit transfer (DBT) scheme, a senior fertiliser ministry informed. In October 2017, the first phase of fertiliser DBT was rolled out, under which subsidy is being transferred to companies after checking retail sales data captured through the Point of Sale (PoS) machines. The transfer of fertiliser subsidy directly into farmers' bank accounts was to be taken up in the second phase after taking inputs from Niti Aayog. The government bears over Rs 70,000 crore annually as fertiliser subsidy to provide cheaper farm nutrient to farmers. "We want to try giving fertiliser subsidy directly into farmers' bank accounts. Now there is a thinking in this line. Now, we are ready for the phase two implementation. When and how -- that is under discussion," the official said. Besides, the government is planning to bring some improvement in the existing fertiliser DBT by allowing retailers to use desktop or laptop along with PoS machines for smooth operation, he said. "Now, the DBT platform is based on a PoS machine. We are coming out with desktop or laptop version. Since PoS machine has small screen, retailers sometimes face operational issues. In addition to PoS, retailers can have desktop or laptop." There are 2.25 lakh fertiliser retailers in the country. The PoS machines will not be scrapped. Providing laptop or desktop will facilitate ease of doing business, the official added. Initially, there were hiccups in implementing the DBT, but over the time those issues have been resolved, he said adding that the government now wants to focus on improving upon capturing the strength of the platform.



With 50% of farmers having no access to KCC, West Bengal misses agri disbursement target

▶ West Bengal has been missing its agriculture disbursement target for three years in a row. The unavailability of data on farmers who have still not been covered under the Kisan Credit Card (KCC) is said to be one of the primary reasons for lower agricultural disbursement in the State. In 2018-19, the State was able to achieve only around 71 per cent of its targeted disbursement under the agriculture sector. The State-Level Bankers' Committee (SLBC) had set a target to disburse close to Rs 64,000 crore worth of agri loans to farmers in FY19. However, banks were able to disburse only around Rs 46,000 crore. Forty to fifty per cent of the farmers in West Bengal were not covered under the KCC, and hence, could not get access to agricultural credit, said a senior SLBC official. A good number of farmers in the State have very small landholdings, and hence, it becomes difficult to map them. As per the census, there are close to 71 lakh farm households in the State, going by the agricultural land holding data; however, of these, only around 52 lakh are active. Of these (52 lakh), only 31-32 lakh farmers hold KCC. The SLBC in West Bengal has, therefore, set up a special sub-committee for agriculture to monitor and prepare a list of farmers who have not been covered under the KCC.

State govt to cover 5 lakh farmers under crop insurance scheme

▶ With a view to expanding crop insurance in Assam, the State government has set a target to cover at least five lakh farmers under the Pradhan Mantri Fasal Bima Yojna (PMFBY) in 2019-20. As part of the plan, the State government has divided all the districts of Assam into clusters for coverage under the scheme. Besides, for the first time since the introduction of PMFBY, the implementing agencies have been selected for a duration of three years, as against for a single crop season, as has been the norm so far. "The aim is to give a major boost to crop insurance in the State. That is why the government has set a target to cover at least five lakh farmers during this year, including the Kharif 2019 season and the Rabi 2019-20 season. So, at least 2.5 lakh farmers are set to be included under the scheme in each crop season, which is a much larger figure than in any of the previous seasons since the scheme was launched in 2016," a senior official said. He added, "The government has also decided to go for a longer duration of allotment to implementing agencies with a view to facilitating the insurance firms to get acclimatised with their respective zones and clusters. Frequent change of agencies discourages them from undertaking long-term efforts. Besides, selection of new agencies every year or each crop season is a very time consuming."

More Kerala farmers to get loan waiver

► The Kerala government will soon issue an order extending the farm loan waiver debt limit to Rs 2 lakh. The existing district-level farmer debt relief commissions will have extended tenures to deal with fresh farm loan waiver applications once the new norms are in place. State agriculture minister VS Sunil Kumar said the state level bankers' committee has considered the government's proposal to include loans availed from scheduled and public sector banks under the purview of debt relief commissions. "We are processing the files. Once the procedures are complete, orders in this regard will be issued," Sunil Kumar told the assembly. Debt relief commissions currently consider only loans availed from cooperative banks. Farm loans of up to Rs 1 lakh taken up to August 31, 2018 by farmers in Wayanad and Idukki are now under the consideration of the debt relief commissions in those districts.



Govt will spend Rs 25 tn to boost farm output, says President

► President Ram Nath Kovind said the government was working toward spending Rs 25 trillion to increase farm productivity, and another Rs 90,000 crore annually to support farmers' income. In his address to the joint session of Parliament, the President indicated that fixing problems in the rural economy and giving relief to farmers was the top priority of the Prime Minister Narendra Modi-led government in its second term. Kovind's speech, which is seen as a statement of the priorities of the National Democratic Alliance (NDA) government that returned to office last month with a landslide victory, indicated that the centre's policy and administrative efforts will focus on supporting the rural economy, resolving the water crisis and empowering



the common man. "Only on a strong rural sector, can a robust national economy stand. The central government is working towards that. Rs 25 trillion will be invested to improve agriculture productivity. Rs 900 billion will be spent annually on PM-Kisan scheme," the President said in his speech, made in Hindi. The minimum income support scheme was first announced in the interim budget in February, which had allocated Rs 75,000 crore for a section of farmers for FY20. However, at the first cabinet meeting of the NDA government's second term the scheme was extended to all 145 million farmers, besides announcing an over Rs 10,000 crore pension scheme for 50 million farmers.

KCC: Centre plans campaign to enrol one crore more farmers

► The Centre plans to launch a village-level campaign to enroll an additional one crore farmers in Kisan Credit Card (KCC) scheme over the next 100 days, said Narendra Singh Tomar, Minister for Agriculture and Farmers' Welfare. The Minister said this during a video conference with the agriculture ministers of States and Union Territories, in which he also urged States to ensure



wider coverage of the Pradhan Mantri Kisan Samman Nidhi Yojna (PM-Kisan) and pension schemes that were recently launched for small and marginal farmers. Currently, there are about 6.92 crore KCC holders, even though there are 14.5 crore operational landholdings, an official statement said. KCC makes farmers eligible for agricultural loan of up to Rs1.6 lakh. Among the major States that have poor KCC penetration are: Bihar, Chhattisgarh, Gujarat, Jharkhand, Maharashtra and West Bengal. PM Kisan is a Centrally-sponsored income support scheme for farmers which would give them Rs 6,000 a year in three equal instalments. From April, the scheme has been extended to all farmers, irrespective of the size of landholdings. Similarly, the first Cabinet meeting of the new NDA government announced a pension scheme that would give Rs 3,000 monthly to small and marginal farmers from the age of 60 if they enrol between 18 and 40 years of age.

Maha farmers' body to sow HT Cotton to defy ban on GM crops

▶ Protesting against government restrictions on BT Cotton and other genetically modified crops, farmers affiliated to the ShetkariSanghatana in Maharashtra said they will continue to plant the banned herbicide-tolerant cotton in their fields in public ceremonies. Meanwhile, officers from the state agriculture department on Tuesday raided the house of ShetkariSanghatana leader Lalit Bahale in Maharashtra's Akoli Jahagir village to collect samples of seeds of genetically modified (GM) HT Bt cotton. Anil Ghanwat, national president, Shetkari Sanghatana, said that from now on ceremonies will be held by farmers in all cotton growing districts of Maharashtra. Sowing ceremonies will be held in Yavatmal, Wardha, Amravati, Ahmednagar and Pune where farmers have also managed to get BT Brinjal seeds, he said. He, however, did not mention the source of the seeds. "With this act of satyagraha, we are now coming forward to motivate more and more farmers to reject unreasonable restrictions in agriculture," Lalit Bahale said, adding that the farmers had planned to plant the illegal BT Cotton on more than 700-800 hectares across the state.

'Maharashtra sugar output likely to plunge'

▶ Sugar production in India's western state of Maharashtra, the country's second biggest producer, is likely to fall by 39.2 per cent year on year in 2019/20 to 6.5 million tonnes because of a drought-hit cane crop. The drop will ease pressure on sugar mills to export surplus sugar and support global prices that fell more than 20 per cent last year, partly because of subsidised exports. "Drought has badly affected crops in the central part of Maharashtra. The cane area has fallen and we are expecting lower cane yields as well," Maharashtra Sugar Commissioner Shekhar Gaikwad informed. Area under cane for the 2019-20 marketing year, which starts on October 1, fell 28 per cent because of drought, he said. Maharashtra received 23 per cent less rainfall than normal during the June-September monsoon season in 2018, State government data shows. The State produced 10.7 million tonnes of sugar in the 2018/19 marketing year ending on September 30. The drought also created a fodder shortage in the State and prompted farmers to feed cane to cattle, Gaikwad said. In the current year, India is likely to produce a record 33 million tonnes of sugar, increasing inventories. The Centre has been providing incentives to mills for overseas sugar sales and set an export target of 5 million tonnes. The drought could prompt India to reduce the export target for the next season, said one Mumbai-based dealer with a global trading firm.

Maha Mango festivals big hit in Maharashtra with farmers selling directly to consumers

▶ Mango festivals have turned out to be a big hit in Maharashtra. Using these as a tool to bring farmers and consumers together on a common platform, the Maharashtra State Agriculture Marketing Board (MSAMB) has organised over 25 mango festivals in the state this season. Through these festivals, farmers have sold over 3 lakh dozens of Alphonso and Kesar mangoes directly to consumers this season, senior officials of the state agriculture marketing board said. A single ongoing festival in Pune that began on April 1, has seen over 60,000 consumers directly interacting with farmers resulting in a business of nearly Rs 14 crore so far. Around 800-1,000 consumers visit these festivals on a daily basis. In Pune alone, mango festivals have been held in 25 areas. Across the state, farmers are expected to conduct business worth Rs 4 crore through these festivals, some of which are still in progress. Some 330 Alphonso growers from Kokan region and 37 Kesar growers from Marathwada region have registered with MSAMB this season, said Deepak Shinde, Assistant GM, MSAMB. Mangesh Kadam, assistant general manager in charge of domestic sales, MSAMB, pointed out that the objective of these festivals is to eliminate the middle man and bring both farmers and consumers together, offering both better returns. These festivals were held in Pune, Nashik, Sangli, Solapur, Aurangabad, Baramati, Indapur, Shirur, PimpriChinchwad, Latur, Akulj, Panvel, Bhiwandi, Kolhapur and Vasai, among others. As the season for the Alphonso is nearing to a close, the mango fests are also in the last stages in some of the places, Kadam said. The idea is to take such festivals to other states as well but we are first gauging their success in Maharashtra. Normally, the growers remain isolated from the consumer and depend on traders for their sale. Returns are also not very remunerative, he said, adding that these festivals have enabled farmers to get healthy rates for their produce. During the start of this season, the average rates for the Alphonso were Rs 700-900 per dozen. After May 20, mango prices came down to Rs 400-600 per dozen and prices are now ruling at Rs 200-400 per dozen, he said. What is important here is that the money directly goes into the farmer's pocket instead of the commission agent or the trader, he said.



Government reviving groundnut oil mills in Gujarat

► The Gujarat government and National Agricultural Cooperative Marketing Federation of India (Nafed) are conducting a joint exercise to revive over 140 closed groundnut oil mills in the state. Sources close to the development said a high-level meeting for the revival of closed oil mills was recently held in the state capital, Gandhinagar, in which Nafed director Dilip Sanghani, representatives of the Saurashtra Oil Mills Association (SOMA) and other top government officials were present. Generally, Nafed is procuring groundnut directly from farmers and releasing stock in phased manner to buyers. The system is good for peasants. However, oil millers are facing practical problem of short supply of raw material despite groundnut stocks stored in Nafed warehouses. Farmers are switching to other crops like cotton and hence groundnut cultivation area has gone down in the state. To solve these, it was decided to involve oil millers in the purchase of groundnut to ensure adequate supply to oil mills, said



Dilip Sanghani, director of Nafed, adding they would encourage farmers to increase cultivation area of groundnut this season by ensuring them on higher prices for their groundnut crop. Sanghani, who is also chairman of Gujarat State Cooperative Marketing Federation Ltd (GUJCOMASOL), said groundnut oil extracted by millers would be purchased for government's Mid-Day Meal scheme as well as selling groundnut oil through fair price shops across the state.

AP unveils Rs 13k-cr DBT scheme for farmers

► Andhra Pradesh chief minister YS Jagan Mohan Reddy has announced a direct income support scheme — RythuBharosa — for land-holding and tenant farmers, fulfilling of one of his electoral promises. The scheme, which will cost the state exchequer over Rs 13,100 crores annually, will be rolled out from October 15 this year, ahead of an earlier plan to start it by May next year. Under the scheme, all farmers of the state with land patta passbook will get Rs 12,500 per annum in their bank accounts, irrespective of size of land holdings. Tenant farmers will be given Rs 2,500 each. The new scheme will replace AnnadataSukhibhava' scheme announced a few weeks before the elections by the previous Chandrababu Naidu government. Under Naidu's scheme, over crore farmers in the state were to get Rs 10,000 annually. Before the polls, only the first tranche of Rs 1,000 could be transferred to a section of the target families, as the beneficiary data base was still being created. After a review meeting, Reddy announced that it would be rolled from the rabi season starting October 15. While a host of states, including Telangana, Odisha, West Bengal and Jharkhand, have rolled out cash assistance (DBT) scheme for farmers since early 2018, the Narendra Modi government came out with a pan-India PM Kisan scheme in February this year. Under the Rs 75,000-crore PM-Kisan scheme, about 12 crore small and marginal farmers (owning land up to 2 hectares) are being given Rs 6,000/year in three equal tranches.

Cargo flights to boost State's agri exports

► Introduction of cargo flights from the Lokapriya Gopinath Bordoloi International Airport will give major boost to agriculture sector in Assam and the export of agriculture products from Assam to different parts of the world is likely to grow in the coming days. A centre to handle perishable cargo is also being constructed at the Airport, which when completed, will add to the benefits of the farmers. Assam Industries and Commerce Minister Chandra Mohan Patowary said that the cargo flights from Guwahati started because of the initiative taken by the present Government and hoped that the exports would increase in the days to come. The Government has already opened six collection centres in different parts of the State for collecting fruits and vegetables and more such centres would be set up in the coming days. Giving details of starting of cargo flight services from Guwahati, the Minister said that a stakeholders' meet was organized in August last year in collaboration with the Airports Authority of India Cargo Logistics and Allied Services Company Limited, a subsidiary of the Airport Authority of India (AAI) to discuss the possibility of exports directly from Assam and that marked the beginning of the project. The first step was to identify the exportable products and the process of talks started with the farmers, exporters and those involved in packaging. The subsidiary company of the AAI built two cold rooms in the LGBI airport and on November 3, 2018 M/S Keiga Export took the first initiative to export two tones of vegetable to London via New Delhi.

Cashew Exports at Two-decade Low in 2018-19

► The Indian cashew industry is facing the double whammy of plunging exports and weak local prices that have hit profitability of the processing units in the country. Exports fell to a two-decade low in 2018-19, down 20% year-on-year to 66,693 tonnes and, in terms of value, down 24% year-on-year to Rs 4,434 crore, according to the data of the Cashew Export Promotion Council of India (CEPCI). From over 100,000 tonnes, the export quantity has fallen steadily in the past few years as Vietnam and other countries held a price advantage over India through lower processing cost. "Our cost of production is around Rs 800-900 per kg. We usually offer discounted price for export and make it up through our domestic sales," said S Kannan, executive director, CEPCI. But last year, domestic sales were hit by an increase in imports of cheaper cashew kernels into the country. "Roughly over 2,000 tonnes of import have come to the country, pushing down the prices of locally processed nuts," said Kannan. The commodity is being imported by declaring it as roasted cashew, which carries no duty under free trade agreement or as cattle feed that has nil duty, he said. Kannan said, "We have alerted the customs and other authorities that what is coming in are plain cashews wrongly declared as other products." As a result, he said, imports have gone down but not stopped altogether.



Many pesticides used in US farms are banned in the EU, says study

► More than a quarter of the total volume of pesticides used in US agriculture are banned in the European Union, and 3 per cent and 2 per cent are banned in China and Brazil respectively, according to a study published Thursday in the journal Environmental Health. Researchers studied herbicides, insecticides and fungicides, and found that of 374 active ingredients authorised for agricultural use in the US in 2016, 72 of them were banned in the EU. Two products in particular were banned in the EU, Brazil and China, including paraquat, an herbicide which the US Centers for Disease Control calls "highly poisonous," which has been banned in Europe since 2007. Phorate, a neurotoxic insecticide, is banned in the EU, Brazil and China, but allowed in the US, though the state of New York has prohibited spraying it aerially. On the other hand, the US has banned only two or three pesticides that are allowed in the EU, Brazil and China, which the study points out are among the largest agricultural producers in the world, along with the US. "(The US) originally had a regulatory agency that was very good, and banned a lot of pesticides, like DDT," study author Nathan Donley, a scientist at the non-profit Center for Biological Diversity, said of the Environmental Protection Agency (EPA), which was created in 1970 and swiftly implemented pesticide regulations. "A lot of Americans are still in that mindset that we have a regulatory agency that's very functional and very protective," he said. "A lot of Americans just don't know how far the US has fallen behind." The EPA's weaknesses are not an issue of Democratic or Republican political power, according to Donley -- the study ended in 2016, the final year of Barack Obama's presidency, and doesn't include information about the agency under President Donald Trump, whose administration has significantly diminished its regulatory ambitions. It is the EPA's pesticide division that is to blame, Donley said, lamenting the influence of powerful agriculture and pesticide lobbies on Congress, which decides the EPA's budget.

Oilmeal exports fall 25% in April, castor seeds gain

► The overall export of oilmeals during April 2019 has been provisionally declined 25% to 1,68,809 tonne, against 2,24,351 tonne in April 2018. The export of castor seed meal, however, has increased to 53,591 tonne against 17,257 tonne, according to the Solvent Extractors' Association of India (SEA). It is mainly exported to South Korea. According to data compiled by SEA, the overall export of oilmeals during 2018-19 has revived and reported at 33,24,693 tonne, against 30,26,628 tonne during the same period of 2017-18. In terms of value, the total earning has increased 34% to Rs 6,410 crore against Rs 4,762 crore due to the higher export of rapeseed meal, BV Mehta, executive director, SEA, said. Export of rapeseed meal rose 65% to 1,094,015 tonne from 663,988 tonne and the export of soyabean meal rose 14% to 13,58,083 tonne from 11,87,818 tonne, he said. During April 2019, Vietnam imported 17,575 tonne of oilmeals as compared to 43,368 tonne in the previous year. This consists of 380 tonne of soyabean meal, 8,795 tonne of rapeseed meal and 8,400 tonne of de-oiled rice bran extraction. South Korea imported 94,847 tonne of oilmeals which consist 43,935 tonne of rapeseed meal and 50,912 tonne of castor seed meal, against 49,649 tonne. Thailand imported 32,337 tonne of soyabean meal, against 19,224 tonne.

'GSP's end will have marginal impact on food exports to US'

► The prices of agricultural and marine products exported to the US from India may become marginally dearer with Washington lifting the duty-free exports scheme available to India; but it may not bring down export volumes much, industry and government officials said. In 2018-19, India exported agri and marine products worth \$4.1 billion to the US. With the withdrawal of the Generalised System of Preferences (GSP), a scheme meant to help developing countries to industrialise better, most of these products exported from India would attract additional duties in the range of 3 to 5 per cent. According to Vijay Setia, President of the All India Rice Exporters Association (AIREA), rice exported to the US would become expensive by 6 per cent. "We do not expect rice exports to take major hit. In the US market, Indian rice brands are sold at prices more or less similar to that in India. It is consumed mainly by the ethnic community. We do not expect them to move away from these brands just because of they are marginally expensive," Setia said. "But it is for the US government to decide whether it wants to make people there to cough up more for staple food," the AIREA president said. In FY2019, Indian firms exported rice worth nearly \$200 million. An official with the Agricultural & Processed Food Products Export Development Authority (APEDA) said the impact on food and other agricultural products exported to the US would be minimal, as on an average, the duty would be in range of 3 to 5 per cent. On the other hand, the trade war between the US and China would open up the China market for India. "We expect our exporters to have a good opportunity in China. Already the Chinese are warming up to Indian agro-based products, the APEDA official said. As marine products enjoy 0 tariff currently, the removal of the GSP tag will not have any impact on marine products exported from India, said Shaji Baby John, CMD, Kings Group of Companies in Kerala.

Hike in import duty expected to boost domestic processing of cashews

► The Centre's decision to hike the minimum import price (MIP) for whole and broken cashew has brought cheers to the cashew processing sector. The stakeholders observed that low-quality cashew kernel shipments from Africa and ASEAN countries had hit the domestic industry. "We are happy with the DGFT notification which was long overdue as low-priced cashew kernel imports impacted the local production. The origin countries impose taxes on export of raw cashew, while they incentivise kernel exports. This has resulted in dumping of cheap and low-quality nuts into India, making the domestic industry uncompetitive," Rahul Kamath, past president of Karnataka Cashew Manufacturers Association. The Directorate General of Foreign Trade (DGFT) hiked the MIP for broken cashew to Rs 680/kg from Rs 288/kg. The whole cashew price has been enhanced to Rs 720/kg from Rs 400/kg. According to RK Bhooles, Chairman, Cashew Export Promotion Council, low-quality kernels from Vietnam, Mozambique, Ivory Coast are being dumped into the domestic market by partly evading the customs duty. This has affected genuine processors, who are finding difficulties in selling their products, as the domestic processing becomes unviable. This has led to closure of many cashew processing units. "We are heavily dependent on imports as the sector needs 16 lakh tonnes of raw cashew for processing. Of which, 8.17 lakh tonnes was produced in the country," he said. The MIP was introduced in 2013 at the then market price.

Soybean meal exports rise by 28% in FY19

► Soybean meal exports during April 2018 to March 2019 has risen by 28.56 % to 24.35 lakh tonne. Exports were 18.94 lakh tonne in the same period of previous year. According to the data released by the Soybean Processors Association of India (SOPA), this year total exports will remain high. By the end of the season, total exports are likely to touch 20 lakh tonne as the country had a good crop last year. The total carry forward stock from the previous year comes upto 0.19 lakh tonne with total production coming upto 74.71 lakh tonne. Around 20 lakh tonne is expected to be exported while 6 lakh tonne would be used as food for domestic consumption and another 47 lakh tonne as feed for domestic consumption. Balance stock of soyabean meal in June is 1.148 lakh tonne. According to the data, around 101.83 lakh tonnes of soybean is available for crushing, direct use and exports. In May 2019, soybean meal exports dropped to 38000 tonne as compared to 75,265 tonne in April 2019. Iran was the main buyer for Indian soyabean meal in May. According to market reports, farmers are expected to plant more soybean this season as they received 15% higher prices at Rs 3,800-3,900 compared to the minimum support price. "At current prices, soybeans are more lucrative than other crops. We could see shift towards soybeans from maize in Madhya Pradesh and cotton in other regions," said DN Pathak, executive director, SOPA.

Prestigious World Food Prize Awarded to East-West Seed Founder Simon N. Groot

➤ Award given in recognition of East-West Seed's contribution to improving nutrition and creating sustainable economic opportunities for small farmers around the world. U.S. Secretary of State Mike Pompeo and President of the World Food Prize Foundation Kenneth M. Quinn announced Simon N. Groot as the 2019 World Food Prize Laureate. Mr. Groot has played a transformative role in improving the health and economic opportunities of small farmer communities in more than 60 tropical countries by helping them move from subsistence farming to horticultural entrepreneurship. Known as the "Nobel Prize for Food," the 2019 World Food Prize honoured the unique achievements of Simon Groot and his company East-West Seed (EWS) over the past four decades. Groot has successfully developed a dynamic, smallholder-centric tropical vegetable seed industry, starting in Southeast Asia and spreading throughout Asia, Africa, and Latin America. His work has invigorated both rural and urban markets for vegetable crops, making nutritious vegetables more widely available and affordable for millions of families each year. "Like Dr. Norman Borlaug before him, Simon Groot has dedicated his life to improving the livelihoods of millions around the world," said Kenneth Quinn. "He and his company have, in effect, developed an impactful global network of seed producers who are transforming the lives of 20 million farmers every year. For this extraordinary accomplishment, he truly deserves to be named the 2019 World Food Prize Laureate."

Climate warriors' being trained to help rural farmers adapt

➤ Almost everyone acknowledges climate change and its impact on agriculture, but there is little material available to the rural population on how to cope with it. The National Institute of Rural Development and Panchayati Raj (NIRDPR) has come out with a training manual for a certificate course on Sustainable Livelihoods and Adaptation to Climate Change (SLACC). The SLACC targets to create a cadre of over 200 certified 'climate-smart' community resource persons in villages, who will help the rural population cope with the the impact of climate change. The project is jointly initiated by the Union Ministry of Rural Development and the World Bank. "They will disseminate climate resilient technologies to the farming communities in villages," an NIRDPR spokesperson has said. "The aim of the course is to train a cadre of resource persons trained in sustainable livelihood practices through adaptation to climate change," he said. "This will go a long way in improving the adaptive capacity of the rural poor engaged in farm-based livelihoods to cope with climate change." The training manual was released by NIRDPR Director General WR Reddy last week. "The programme will strengthen the skill sets of resource persons at national and grassroots levels. It is being implemented in 638 villages in Mandal and Sheopur districts of Madhya Pradesh, and Gaya and Madhubani districts of Bihar under National Rural Livelihoods Mission," he said.



Krishi Vigyan Kendra launches farm-service centre

➤ To combat the shortage of skilled labour for farming activities, the Ernakulam Krishi Vigyan Kendra (KVK) of the Central Marine Fisheries Research Institute (CMFRI) has launched a farm service centre equipped with a wide range of machineries and equipment to offer paid services in all kinds of farm initiatives. Aqua, animal and agri farmers of the Ernakulam district can make use of the facility. The centre will offer all kinds of machinery ranging from tractors, power tiller, power weeder, to water pump. In addition, scientific advisories will be provided during the farm visits. A Gopalakrishnan, CMFRI Director who inaugurated the centre, said the new initiative will benefit hundreds of farmers who are struggling owing to the shortage of technically trained labourers. The farm service centre has been set up at a cost of Rs 40 lakh under a project of the Centre to popularise mechanised farming, he said. At present, trained staff of the KVK provides these technical services such as land and pond preparation. Self-help groups will be formed in future to make available the farm services to large-scale farmers. More equipment and machinery will be added soon, he added.

Coffee Board takes tech route to help growers boost yield

For the 3.5 lakh coffee growers in India, 98% of whom are small-scale, challenges affecting production include labour shortage, climate change and pest attacks. One way to manage these is by adopting technology, which the Coffee Board is trying to bring about for the growers. Last year, Eka Software Solutions took up a pilot project for the Coffee Board of India on machine-learning based applications. According to Shuchi Nijhawan, vice president – agri business for Eka Software, the Board and the company took up three areas to try machine learning based apps. One was addressing the white stem borer problem, another was weather forecasting, and the third, predicting leaf rust. “Based on the data, photos provided, we created a machine learning algorithm to forecast each of these issues (for a grower). We worked with 20 liaison officers of the Board and they coordinated with the growers. “The success of the app depends on the data fed in. In the case of white stem borer, the growers and the Board have validated 90% accuracy,” she says. Eka’s digital platform for agriculture aggregates data from different sources and applies the algorithm to provide insight to the coffee growers.



Horticulture yield likely to rise at 314.87 mt

Despite over 42 per cent land areas suffered drought like situation last year, the country’s total horticulture production is estimated to rise marginally to 314.87 million tonne in the 2018-19 crop year, which is 1.01 per cent higher than the year 2017-18. The area under horticulture crop also rose to 25.6 million hectare from 25.43 million hectare. Under the horticulture crops, production of fruits is estimated to be around 97.38 million tonnes in 2018-19 compared to 97.36 million tonnes in the previous year. Interestingly, mango production is projected to be lower despite higher cultivation this year. According to agriculture ministry, vegetables production is estimated to rise 1.6 per cent at around 187.36 million tonnes. Among vegetables, onion Production is estimated to be around 23.28 million tonnes, slightly higher than production in 2017-18. Potato production is estimated to be around 52.96 million tonnes, which is 3.2 per cent higher than 2017-18. Tomato production is estimated to be around 19.66 million tonnes, which is 0.5 per cent lower than 2017-18.

Using genes to understand rice blast disease resistance in Indian rice varieties

Rice blast, caused by a fungus *Magnaportheoryzae*, is one of the major diseases of the rice crop. Now, researchers from ICAR-National Rice Research Institute (NRRI), Odisha have mapped out the diverse genes in rice that help in disease resistance. By characterising over 150 rice varieties from nine States across the country they also identified new markers associated with blast resistance. From 1980-1987, seven blast endemics have occurred in India causing severe losses. Fungicides are very expensive, harmful for the environment and inappropriate application can cause health issues. So researchers around the globe have been on a hunt for resistant genes against the pathogen and so far, more than 100 resistance (R) genes in the rice genome have been identified. “The rapid changes in pathogen virulence pose a constant challenge to the success of existing blast-resistant rice varieties. Therefore, there is always a need to identify new broad-spectrum blast resistant genes/alleles in rice germplasm such as landraces, wild rice, etc,” explained Manoj Kumar Yadav from NRRI and the first author of the paper published in PLOS ONE. The seeds of landraces grown over nine states were collected from the National Gene Bank, ICAR-NRRI, Cuttack. Leaves’ resistance to blast disease was checked by growing the seeds in uniform blast nursery for two wet seasons (2015 and 2016) at the experimental farm of the institute. This farm is considered as the hot spot for leaf blast disease and the disease was recorded 25 days after sowing. The present study showed that the rice landraces collected from north-eastern states of India had the highest resistance. Dr. Yadav explains that this may be due to co-evolution of resistance genes along with the fungal pathogen over several centuries.



CROP PRO



TECTION

KEY TO FOOD SECURITY

Crop Protection is a significant component of crop management. A good crop always does not ensure a good harvest or better returns. A number of factors influence the outcome, and pest and diseases are an important determinant. On an average, 20-30% of food produced is destroyed by the incidence of pests and diseases in India which translates to around Rs. 45000 crore loss for the farmers. This is a monumental loss considering our resolve

to double farmers' income by 2022. At this juncture, it becomes imperative to contain these losses. Crop Protection therefore assumes significance.

CROP CARNAGE

Damage to crops by biotic elements is universal. Fungal infections, according to a study destroy at least 125 million tonnes of the top five food crops of the world -- rice, wheat, maize, potatoes and soybeans -- each year. These crops provide the majority

of calories consumed by people worldwide. World over, the damage by fungi to rice, wheat and maize alone costs \$60 billion per year. The effects assume catastrophic proportions for the developing world, where 1.4 billion people live on less than \$1.25 per day, and rely most heavily on these low-cost foods. Stemming fungal diseases alone in the world's five most important crops could feed more than 600 million people.

Insect pests are also important while considering the losses inflicted to crops. There are around 10,000 species of insects who eat and damage crops. Of these, only 10 per cent are considered to be major pests. However, these insect pests are potent enough to destroy one fifth of the global crop output annually. In India the losses due to insect pests have come down from 23.3 per cent in the post green revolution era to 15.7 per cent now. This loss calculates to around US\$ 36 billion annually. Globally, the losses come to around 1.3 billion tonnes per year.

India loses agricultural produce worth over \$11 billion — more than the Centre's budgetary allocation for agriculture for 2017-18 — annually

India loses agricultural produce worth over \$11 billion — more than the Centre's budgetary allocation for agriculture for 2017-18 — annually to weeds, according to a study by researchers associated with the Indian Council for Agricultural Research (ICAR)

to weeds, according to a study by researchers associated with the Indian Council for Agricultural Research (ICAR). At \$4.42 billion, the actual economic losses due to weeds were found to be highest in rice, followed by wheat (\$3.376 billion) and soybean (\$1.56 billion). However, the average yield loss is the lowest in rice — 14 per cent in transplanted rice and 21 per cent in direct-seeded condition. The overall loss went up because of high rice production in India, said the study. The greatest average loss, on the other hand, was reported from groundnut cultivation, followed by maize and soybean. A groundnut farmer on an average lost 36 per cent of his crop to weeds, resulting in an estimated loss of \$347 per hectare.

The average losses in maize and soybean farming were \$136/ha and \$117/ha, respectively. The average yield loss in wheat was \$116 per ha. The researchers, from the Jabalpur-based Directorate of Weed Research (DWR), estimated the economic losses using data generated by an all India co-ordinated research project on weed management, which carried out 1,580 on-farm research trials on 10 major crops at different locations in 18 States over a decade. Studies some years ago showed that globally, weeds are responsible for decreasing production of the eight most important food and cash crops by 13.6 per cent, leading to an economic loss of \$100 billion.

Crop epidemics that led to Irish famine and Bengal famine have very well established the impact plant diseases can have on a country and its people. A well managed strategy for crop protection thus becomes pertinent in any crop production plan. While some are based on prophylaxis, others are curative.

CROP CARE CHEMICALS

The disease and pest incidence are inevitable components in today's agriculture. Changing climates have resulted in new pests and diseases and aggravation of minor pests. Regularity in their occurrences have warranted an in-built regime of crop





AGRICULTURE OUTPUT AND SPEND ON CROP PROTECTION CHEMICALS

Country	Agriculture Production in US Dollar per USD of pesticide spent	Pesticide Spend per (Billion USD)
China	126	8
India	126	2.5
USA	31	9
Brazil	10	13

Source: DAC

protection measures that focusses more on prevention and containment. Although efficacy of plant protection chemicals are undisputed, their continuous and indiscriminate use have far outweighed their benefits and brought the side effects to the center stage. The result was the adoption of integrated pest and disease management wherein chemical means of pest management were one of the components.

Among the most commonly used chemicals in agriculture - Insecticides, fungicides and herbicides- insecticides form the highest share in total pesticide use in India. In the year 2014-15, pesticide consumption was 0.29 kg/ha (GCA), which is roughly 50 per cent higher than the use in 2009-10. The recent increase in pesticide use is believed to be due to the higher use of herbicides as cost of manual weed control has risen due to increase in agricultural wages (FICCI, 2015). However, per hectare use of pesticide in India is much lower as compared to other countries like China (13.06 kg/ha), Japan (11.85 kg/ha), Brazil (4.57 kg/ha) and other Latin American countries.

If we compare with other countries, India's spend on crop protection chemicals is \$2.5 billion, which is just 0.8 per cent of total agrarian production. It means that India and China's per dollar spend on crop protection chemicals stand at \$126, which is far higher than that in countries like US and Brazil. Indian farmers may be termed as using crop protection chemicals in a more efficient way with a better generation of agricultural produce.

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Per hectare consumption of pesticides was the highest in Punjab (0.74 kg), followed by Haryana (0.62 kg) and Maharashtra (0.57 kg) during the year 2016-17, while the consumption levels were lower in Bihar, Rajasthan, Karnataka and Madhya Pradesh

This is in contrary to the claims of excessive and inefficient use of chemicals by Indian farmers for plant protection. The data above suggests that India uses fewer chemicals than many of the developed nations and other emerging economies of the world. It is evident that China has got less arable area (106 million hectare) than India (155 million hectare).

Among the states in India, Maharashtra tops in pesticide consumption, followed by Uttar Pradesh, Punjab and Haryana. During the last decade, the total consumption increased in Maharashtra and Uttar Pradesh, while it slightly declined in Punjab and Haryana. States like West Bengal, Gujarat and Karnataka have seen a steep decline in the total consumption. On the other hand, Chhattisgarh and Kerala showed a steep increase in total pesticide consumption. Per hectare consumption of pesticides was the highest in Punjab (0.74 kg), followed by Haryana (0.62 kg) and Maharashtra (0.57 kg) during the year 2016-17, while the consumption levels were lower in Bihar, Rajasthan, Karnataka and Madhya Pradesh.

The share of pesticides in the cost of cultivation was 3 per cent in cotton, 1.9 per cent in paddy, further lower in wheat (0.7%) and sugarcane (0.3%). Agricultural Input Survey data show that in 2011-12, per cent area treated with pesticides was the highest in cotton (66.70%) followed by arhar (64.74%), jute (53.27%) and paddy (48.62%) and low in maize (25.01%). Over the period 1991-92 to 2011-12, there has been a substantial increase in the proportion of area treated with pesticides across all crops, except cotton and jute. However, during 1991-92 to 2011-12, difference between the proportion of area treated with pesticides under irrigated and unirrigated conditions has narrowed down primarily because of the use of hybrids in rainfed areas which require effective pest management.

Pesticide production in India is dominated by insecticides and fungicides followed by herbicides and rodenticides. However, the share of insecticides has come down from more than 70 per cent in 2003-04 to 39 per cent in 2016-17. The shares of fungicides, herbicides and rodenticides are growing over the period. The growth in the use of fungicides is high mainly because of their application in fruit and vegetable crops. Major pesticides produced in India are Mancozeb, 2-4-D, Acephate and Profenofos. Total export of agrochemicals in 2016-17 stood at 377.76 thousand tonnes, with the share of fungicides being the largest in terms of export quantity (45.94%) and herbicides accounting for the largest share in terms of value of exports (28.19%). As per data provided by Central Board of Excise and Customs (CBEC) for the year 2016-17, top five pesticides exported from India were Mancozeb, Cypermethrin,



Bio-pesticides have the potential to control crop losses and reduce negative environmental effects. 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. Bio-pesticides can serve as a reliable, sustainable and environment friendly options. But the pace of development of market for bio-pesticides is not so impressive. 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.



Sulphur, Acephate and Chlorpyrifos, while the major products imported were Glyphosate and Atrazine. The trade data need careful interpretation as both formulations and technical grade pesticides are traded by different firms. However, Indian firms mostly import technical grades, or formulations which are protected through patents, and the exports are mostly of formulations. Brazil, USA and France are the major destinations for export of agro-chemicals from India, while China and Germany are major exporters of agro-chemicals to India.

BEYOND CHEMICALS...

Although chemicals have become synonymous with plant disease management, there exists a wide array of crop protection measures. They may not yield a standalone result, but together with the rest of the measures, they can help in reducing the chemical load on the plant.

Resistance is the first line of defense against invading pathogens and pests. Therefore most of the breeding programmes include Plant disease and pest resistance as an important breeding strategy. Many of the varieties and hybrids thus developed have exhibited fantastic results. Other than the conventional breeding, genetic engineering has also yielded excellent outcomes. In 2009-10, Bt cotton spread to 85 per cent of the India'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 get better yields. The genetically engineered crop varieties offer a promising direction as it combines the qualities of pesticides without polluting the immediate environment with harmful chemicals.

SPURIOUS PESTICIDE SPEWING TROUBLE

The flourishing spurious pesticide market is worth about Rs 1,200 crore. Almost a fourth of the total Indian pesticide market is accounted for by the spurious or sub-standard brands.

Nearly one-fourth of pesticide samples sold in open market are substandard and losses on account of use of such spurious products are estimated at Rs.30,000 crore to the farming community, according to Bharatiya Krishak Samaj (BKS). Out of a total 50 samples of pesticides sold in open market, 13 have been found to be substandard in a test conducted at a government lab. Makers of spurious pesticides usually imitate popular and expensive brands from multi-national and leading Indian manufacturers that have better acceptance among the farmers. Some counterfeit pesticides do not even contain any active plant protection ingredient and largely comprise materials like talcum powder, chalk powder, any odd solvent or just kerosene. Others may contain some active ingredients but only a fraction of that mentioned on the label.

Inadequate legal and other preventive action by the authorities concerned against manufacturers and traders of fake and sub-normal pesticides accentuate the situation. The adoption and adherence to good manufacturing practices should be made mandatory for pesticides manufacturers. State-level pesticide testing laboratories need to be revamped and equipped with modern technology to ensure better monitoring of the pesticides quality.



But the lack of confidence in the genetically manipulated technologies and the lingering doubts about the crossover of these 'foreign' genes to local varieties have marred the prospects of this technology. It has been almost close to two decades 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 and GM Mustard, the introduction of which is still pending today owing to the differing positions of 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.

Plant disease forecasting is an underexploited area in India. Pest and diseases are dependent on weather variables to a great extent and many models have been developed to predict the onset of diseases and pests. However, those models are seldom used in

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conventional agriculture. But in years to come, model based predictions would find favour in agriculture. Access to weather data and derived variables from temperature, rainfall, humidity, and other measurements, is essential for developing, testing, and evaluating these models. In consonance with meteorology department, prediction models can be developed and applied across farms in India. An example of a multiple disease/pest forecasting system is the EPIdemiology, PREdiction, and PREvention (EPIPRE) system developed in the Netherlands for winter wheat that focused on

multiple pathogens.

Biopesticides and biocontrol agents present another dimension of crop protection. This assumes significance considering the resolve of many states in India to go completely organic. Biological control or biocontrol is a method of controlling pests using other organisms. Neem-based bio-insecticide is used against Diamondback moth, *Plutella xylostella* in cabbage management. Farm yard manure (FYM) enriched with *Trichoderma harzianum* is used to control thrips, mites, and soil-borne diseases and *Pseudomonas fluorescens* is used for inducing systemic resistance in hot peppers. *Beauveria bassiana* alone or in combination with BT have been used to control soil insects including potato beetles. The isolates of *Trichoderma* spp. have been characterized for biopriming, plant growth promotion characteristics, reduction of disease incidence, and corresponding yield increase in cabbage, cauliflower, mustard, and field pea. There are many successful biocontrol agents that have been

tested and commercialized in India. Bioformulation like Kalisena (*Aspergillus niger*-based formulation) and Josh (VAM base formulation) were also found to be effective in managing wilt infections in Indian conditions.

Nanotechnology is a fascinating and rapidly advancing science and has the potential to revolutionize many disciplines of science, technology, medicine and agriculture. Conversion of macromaterials in to nano size particles (1-100 nm) gives birth to new characteristics and the material behaves differently. Nanomaterials can be potentially used in the crop protection, especially in the plant disease management. Nanoparticles may act upon pathogens in a way similar to chemical pesticides or the nanomaterials can be used as carrier of active ingredients of pesticides, host defence inducing chemicals, etc. to the target pathogens. Because of ultra small size, nanoparticles may hit/target virus particles and may open a new field of virus control in plants. The disease diagnosis, pathogen detection and residual analysis may become much more precise and quick with the use of nanosensors.

CROP PROTECTION CHALLENGES

Predictions place India as the most populous nation in the world by 2022. Currently supporting nearly 17.84% of the world population, with 2.4% land resources and 4 % of water resources,

India is precariously perched in a position to meet the demands of a constantly expanding population. With the inevitable loss of about one fourth of total harvest to pest and diseases, crop protection becomes an important part of agriculture. Crop protection industry thus is slated to play a pivotal role in ensuring food security of the country. For that notion to materialize, we need to address the challenges the sector face.

Pest and disease dynamics are constantly changing and so it becomes incumbent upon the industry to cater to the differing demands. The sector therefore is in the cusp of constantly changing technologies to suit the varied demands and R&D becomes a priority. But higher cost on R&D deters many manufacturers from investing in new solutions. R&D to develop a new agrochemical molecule takes an average of 9 years and approximately Rs.1,000 crores. Indian companies typically have

Lack of education and awareness among farmers is counted as one of the main reasons behind failing efficacies of the crop protection product and their misuse. The main point of contact between the farmers and the manufacturers, the retailers too are not bothered or are unable to provide a proper understanding of the product to the farmers





The sweeping changes in the climate, the continued emphasis on sustainability of agriculture and environmental concern, the industry will be keen on investing in better delivery techniques and products that leave very little impact on the plant and the soil

not focused on developing newer molecules and will face challenges in building these capabilities, while continuing to remain cost competitive.

Farmers at large remain unaware of the new products or they lack the knowledge regarding a product at hand. This is a precarious situation as the efficacy or the usefulness of the product is closely linked to the knowledge of the user. Lack of education and awareness among farmers is counted as one of the main reasons behind failing efficacies of the crop protection product or their misuse. The main point of contact between the farmers and the manufacturers, the retailers too are not bothered or are unable to provide a proper understanding of the product to the farmers. Also, very often farmers are not able to communicate their needs effectively. Post harvest losses are yet another segment of yield losses suffered by farmers. Supply chain inefficiency and inadequate infrastructure are the major causes for such losses. The lack of knowledge of the farmers that there are products and storage techniques to effectively cut short these losses have added to the agony of the sector.

The threat of spurious products is real and their use by the gullible farmers have questioned many times the veracity of plant protection products. These

products not only failed to kill pests but also inflicted damages on crops and not to mention the economic losses suffered by the farmers.

Climate change is another important development that has affected global population and agriculture. Pest and disease dynamics have altered considerably. Many minor pests have become major pests and many new pest and diseases have emerged. This has kept the crop protection sector on toes. Besides the sweeping changes in climate, the continued emphasis on sustainability of agriculture and environmental concern, the industry will be keen on investing in better delivery techniques and products that leave very little impact on the plant and the soil.

Crop protection is in constant evolution. Lethargy either in terms of technology development and delivering the technology to the farmers would be critical lapses for a country like India, where agriculture is a source of income to more than half of its population. With a real possibility of an increasing population, India needs to invest in better technologies and surveillance for better results. We cannot afford to lose one quarter of our production to pest and diseases which could be clearly avoided through better crop protection strategies.

'INDIA NEEDS STRINGENT POLICIES TO COUNTER ILLICIT TRADE OF SPURIOUS PESTICIDES'

Dhanuka Agritech Limited, manufacturer of a wide range of agro-chemicals, has a pan-India presence with a network of more than 7,000 distributors/ dealers selling to over 75,000 retailers across India and reaching out to more than 10 million farmers. Highly innovative, Dhanuka keeps adding new products every year through its global collaborations and is continuously on the lookout to bring the latest technology to Indian Farmers. Speaking with Rashmi Singh, Business Editor at Agriculture Today, the Chairman of Dhanuka Agritech Limited, Shri R.G. Agarwal highlighted the significance of crop protection products in Indian agriculture and stressed on bringing in stringent policies to curtail trading of spurious and illegal pesticides.



What is the significance of Crop protection products in Indian agriculture?

Crop protection is similar to pharmaceuticals used by human beings. They are needed to protect the crops from the attack of insects, weeds and diseases. They are not only needed in India but used all over the world. There is no innovation in our country and the technologies that are in use in India are courtesy of the multinational companies. If we don't use pesticides, then as per the report of IARI (2008), there may be crop losses of up to 8-90 percent. A committee under the Ministry of Chemicals and Fertilisers (2002) estimated crop losses of over Rs. 90,000 crore. Recently, in the parliament session, the crop loss issue was discussed during question hour round, where the fact that 10-30 percent crop losses are happening annually in India was highlighted. So, if we take its average as 20 percent, then sighting the present market value of agriculture production, this loss may not be less than Rupees 5 lakh crores. And the question then arises; can India afford this loss of Rupees 5 lakh crores? Today, none of the companies in India is competent enough. It takes nearly Rs. 2000 crore investment in a period of 10-12 years for innovating a new molecule and for such kind of investments, even MNCs find it difficult and that is why, we witnessed certain mergers of companies, eg,

Dow Chemicals & DuPont, Monsanto & Bayer, FMC & Cheminova, Syngenta & ChemChina. At present, we can't think of original research in our country and we are using only the generic pesticides. We manufacture those pesticides that are patented internationally and so, their costs come down. Well, it is not always cost though. When a new technology is brought into practice, it is always costly. So, we have to deal with the cost-benefit ratio in a right perspective for the benefit of the farmers in the long run.

How has digitisation influenced agriculture in general and crop protection in particular?

We have around 14 crores of farmers in more than six lakhs villages in India. Reaching out to them by any individual or institutions is impossible. In today's scenario, with the use of smart phones, one can take the technology to a large number of farmers inhabited in remote areas. Through the availability of smart phones, farmers can find the right solutions to their problems by downloading certain apps, or they can reach easily to companies like us by sending images regarding their problems to get the accurate solutions. So, in this way, digitisation can help farmers to a large extent. We are still at a nascent stage but internationally, all the data comes through satellites

and they are very much precise in agriculture. Overall, digitisation could help farmers in getting technology at their doorsteps eg- weather forecasting, prediction of diseases in advance, projection of insect attack, estimation of market prices etc. would be very helpful to the farmers.

Why does India lag behind when it comes to introducing new molecules in the crop protection segment?

Chlorinated pesticides like DDT, BHC, lindane, Chlorobenzilate etc were used by the farmers in the beginning. They remained in soil for a longer period of time. They were used in kilos per hectare. So, they were later banned by the government. The new technologies use pesticides just in grams. It sends less chemicals-pesticides load in the environment and are harmless. There

is no original research in our country. All toxic pesticides are banned now. Our country is also working in that direction. But unfortunately, bringing out safe molecules processes are very slow. For example, in our country around 250 pesticides are available to farmers, while Pakistan has 500 kinds of pesticides and U.S has almost 750. The reason being the registration of a new molecule in our country, takes the time period between 5-7 years. The Insecticides Act(1968) says that the registration period should be limited between one to one and half years and not more than that. But, that doesn't happen, and because of which, the cost of the molecule increases and new pesticides become a farther dream to reach for the farmers. Ultimately, they lose crops in huge amount. Apart from that, insects develop resistance to the regular use

of the same pesticides. For example, a new pest called Fall Army Worm from Africa and America has affected crops to a large extent and we have no solution to curb that pest. Considering this fact, government has accepted adhoc recommendations of some pesticides based on some international data. So, why can't we expedite the process? The Chemicals and Fertilisers industry is a regulated industry. The Insecticides Act, 1968 & Insecticides Rules, 1971 regulate overall processes of control mechanism. Any product contrived by any company, which has to be manufactured or marketed, needs separate registration under Central Insecticide Board and Registration Committee in the Ministry of Agriculture. This is headed by a secretary. It is a full-fledged department where files are submitted and are scrutinised as per the instructed protocols. In India,



registering a new product and commercialising it, may cost around 75 – 100 crores of rupees of investment. This also involves 5-15 years of data protection.

What are the challenges faced by the Crop Protection industry today and how can we minimise them? What necessary steps can be taken by the government to address those issues?

Data protection is a challenge for the registration of a new molecule. The next biggest thing is improper implementation of the Insecticides Act. Because of which, vested interests get involved, causing illegal smuggling of spurious and counterfeit pesticides and thus, duplicate trade flourishes. Since, farmers are not educated enough, they can't make out which of the pesticides would benefit them and which one would harm their crops. Apart from that, the audit that needs to be done by the inspectors from time to time is also inconsistent. This is an important step for drawing the samples for quality control. Over 5000 companies have been given licences unnecessarily. Thus, illegal products are being sold in the market freely and farmers are being cheated additionally. In that case, it becomes important to execute the Act in the right direction to curb all the challenges for the sake of the farmers. As per the survey conducted by the Ministry of Consumer Affairs, 58 percent of agri-inputs sold in the rural areas are spurious. Then another report prepared by Tata Management Services (2015) cited that nearly 25-30 percent of the pesticides brought into the market are illegal.

What are the other control strategies integrated into practical pest management programs covering high and low level of inputs in agricultural systems across varied geographical regions in India?

Firstly, the will of the government takes the first and foremost stage to regulate or implement any scheme. Proper implementation and execution of Insecticides Act 1968 would have solved most of such problems faced by the farmers. Secondly, putting QR code for each product can be confirmed from smart phone be an effective step to minimise the selling and trading of

spurious pesticides. Then, inspectors can play a big role in cancelling licences of unlawful companies. Educating farmers regarding the use of right pesticides for their crops is a crucial step. China's agriculture GDP is three times higher than India despite having agriculture land of nearly 128 million hectares while our country possesses nearly 142 million hectares of the farm land. China gets a minimum of 600 mm of rainfall, while India receives over 1000 mm of rain but China's agriculture GDP was \$999 billion and Indian Agri GDP was only \$401 billion in the year 2018. This difference in the GDP itself justifies how serious we are towards our farm sector and farming community.

Most of the chemicals used in the pesticides directly or indirectly affect the Food chain system. What are the parameters taken on behalf of the Crop protection companies to deal with those dangers?

It is a myth which has been spread through different agencies regarding the use of chemical pesticides, entering food chain and creating harm to the system. There is no such statistics and data that can prove it even. The Ministry of Agriculture, which is the official body and All India Residue Network tested around 16,000 samples of various foods throughout country in their 25 NABL labs and hardly in 2 percent samples, pesticides was found above Minimum Residue Limit (MRL) fixed by the Food Safety Authority of India. In comparison to Europe, U.S and in many other countries, we are using just 2 percent of the pesticides of what they use and we produce 16 percent of the food of the world. In Global context, we use 600 grams of pesticides per hectare, while Japan uses 10 kilo grams and China, 13 kilo grams. So, it is all just a myth as people do not know the real facts and figures and no efforts have been made to pass on the correct information. As per the world-renowned Indian scientists: Dr. Debabrata Kanungo (Retd. Additional Director General and board member of FSSAI), Dr. K. K Sharma (a residue chemist and Head of All India Residue Network) and Dr. Sandhya Kulshreshtha (a Medical Toxicologist), pesticides are safe enough to use.

'THERE WILL BE A DEFINITE INCREASE IN CONSUMPTION OF AGROCHEMICALS AND SOIL NUTRIENTS'



Indofil Industries (International) BV, a Netherland based holding company of Indofil Industries Ltd. headquartered at Mumbai India has acquired majority stake in Agrowin Biosciences, a crop protection and plant nutrients company based in Milan, Italy. Recognising the strong presence of Agrowin in European Agribusiness market of Italy through its distribution network and brand equity, Indofil with its own expertise in manufacturing, product development, regulatory and global Agribusiness technology see this acquisition to create a stronger presence in European markets. The Italian agrochemical market presently is third largest in Europe with market size of USD 1.2 billion. With its varied climatic zones, Italy grows large number of crops like vines, fruits vegetables, cereals sugar beet to name a few. Fungicides are the most important crop protection segment in Italy. Indofil Industries Limited, established in 1965, as a Crop Protection & Specialty Chemicals Company with a turnover of over USD 360 Million, has direct presence in Indian market through a large sales organization and well spread distribution network. It also has presence over 100 countries

through direct distributors as well as five operating subsidiaries. It derives 50% of its revenue from international business. Indofil has five manufacturing plants supporting its product range, a backward integration through manufacturing joint venture Indobaijin and strong R&D and product management team. In an interview with Agriculture Today, Mr. R. K. Malhotra, Group CEO, Indofil Industries discusses the prospects of this association.

How significant is the partnership with Agrowin Biosciences for Indofil?

Agrowin has a strong presence in European Agribusiness market of Italy through its distribution network and brand equity. Indofil has its own expertise in manufacturing, product development, regulatory and global Agribusiness technology. Hence this partnership will help Indofil create a stronger presence in European markets.

How is the association with Agrowin going to influence the operation of Indofil in the rest of the market?

The synergies will affect both the Italian business, through direct presence and strong partnerships with key national distributors, and the European business development, leveraging Agrowin expertise and network.

How important as a market is Italy and how will the presence of Indofil going to leverage the company's foothold in Europe?

Italy is the 3rd agribusiness market in Europe, accounting for USD 1.2 billion with a relevant fungicides business. Agrowin, giving a stronger position in this important market will contribute to feed the growth of Indofil and will provide a good platform for launching several new and differentiated products in Europe.

What are the other future associations that are in the pipeline for Indofil?

There are similar opportunities that are being explored by Indofil in similar Agribusiness markets.

In terms of products, are there any new additions to the Indian products profile?

Indofil has recently commissioned new technical synthesis plant focused at Oomycetes segment fungicides for F&V, Azoles and SHDI's fungicides



for rice crop besides facility for Triazoles & couple of other chemistries. Among new introductions Thaifluzamide based product (Iglare) & Tricylazole based patented mixture (Impression) are the unique offerings.

How has Indian crop protection market changed over the years?

India is currently the 4th largest manufacturer of agrochemicals after The United States, Japan and China. In 2016, agrochemicals market was valued at \$4.1 billion and is expected to grow at a growth rate of 8.3 percent to reach \$8.1 billion by 2025. There is a continuous learning curve & awareness amongst the Indian farmers regarding the safe and correct use of agrochemicals, along with its right dosage and its applications. Indian market has witnessed a significant rise in the use of fungicides & herbicides on crops like fruits, vegetables and soybean. However Insecticides continue to dominate the market, contributing to about 50%. It has been one of the key objectives of the Prime Minister of India Narendra Modi to "Double farmer's income by 2022." Thus, there will be a definite increase in consumption of agrochemicals and soil nutrients.

POSITION PAPER ON FALL ARMYWORM



Fall Armyworm (FAW) is a destructive pest native to the tropical and subtropical regions of the Americas, having been found everywhere from South America to eastern and central North America. FAW targets more than 80 different plants including maize, rice, cotton, sugarcane, wheat and soybeans, and has been particularly devastating in the maize producing regions of Brazil, Africa and recently India.

The pest was first detected on the African continent in Nigeria in January 2016 and has quickly spread to 44 countries across sub-Saharan Africa. In 2018, the pest was reported in Asian countries such as India, Thailand, Sri Lanka, Myanmar, and Bangladesh. Its spread

across the continent has continued in 2019. FAW was detected for the first time in Pu'er City and Dehong in the Yunnan Province of China, and most recently has been found in Vietnam. The FAO has warned that it could threaten the food security and livelihoods of millions of small-scale farmers in Asia as the pest is likely to spread further, with India, South East Asia and South China most at risk. It is thought the pest could also spread to Europe.

Based on data from Africa, CABI estimates FAW will reduce annual maize production by 21%-53% in the absence of pest management.

This CropLife International and CropLife Asia position paper outlines the holistic approach to ensure effective management of FAW

through integrated pest management (IPM); clear, evidence-based advice to farmers; a regulatory environment that gives access to technology; stakeholder coordination and emergency phytosanitary measures. Our collective goal must be to protect farmer livelihoods and ensure food security globally, but especially in the high-risk regions of Asia.

AN INTEGRATED PEST MANAGEMENT (IPM) APPROACH

The components of IPM should be based on evidence of their effectiveness and awareness of their risks. Such a position has been clearly outlined by the World Trade Organisation Committee on Sanitary and Phytosanitary Measures as



submitted by Brazil, Kenya, Madagascar, Paraguay, the United States of America and Uruguay.

A sound IPM strategy should include effective scouting and monitoring for the pest and preventative measures to stop any infestation. Where an economic threshold is reached, farmers must be given access to effective tools to prevent the destruction of their crop, as outlined in the US Agency for International Development (USAID) guide for IPM in Africa.

For successful IPM intervention, the cost-effective tools available to farmers should include:

- **Insecticides- Seed Treatment and Foliar applications.**

Insecticides are one of the few proven and effective tools for the management of FAW, and their deployment should be given balanced consideration – through both foliar applications and seed treatments. A practical approach for small-scale farmers must focus on:

- Seed treatments: FAW often invades at an early stage. Damage during emergence and the early growth period has a major impact on final crop yield.
- Using in-country registered pesticides, and pesticides that are recommended to effectively control FAW by credible resources (governmental / non-governmental);
- Avoidance of illegally traded pesticides and/or counterfeits;
- Avoidance of WHO class 1a acute toxic pesticide or only use them where farmers

are trained and use respective precautions (or as a last resort);

- Pesticide procurement that follows demand and requirement, and has appropriate measures in place to ensure obsolete stocks do not result;
- Guidance to avoid build-up of resistance.
- Plant Biotechnology

Insect-resistant biotech crops have been another tool in the IPM approach and used successfully across North and South America in effectively managing FAW. The effectiveness of biotech maize against FAW has been demonstrated in field trials in Kenya, Mozambique, South Africa, Tanzania and Uganda through the Water Efficient Maize for Africa (WEMA) project. Furthermore, despite the millions of hectares of maize in Africa that have been devastated by FAW in 2017, South Africa has largely been exempt from the infestation. This is due in part both to the 1.6 million hectares of insect-resistant, biotech maize planted in South Africa and the commercially available and approved pesticides.

The FAO has previously stated that it is “imperative for Africa to make biotechnologies, knowledge and innovation available, accessible and applicable to small farmers to help them maximize their agricultural productivity while keeping the environment healthy and sustainable.

The FAO has previously stated that it is “imperative for Africa to make biotechnologies, knowledge and innovation available, accessible and applicable to small farmers to help them maximize their agricultural productivity while keeping the environment healthy and sustainable



“This statement of FAO should also be applied to Asia. We urge policy makers in countries from Asia where biotech crops are currently unavailable, to develop the regulatory framework to provide farmers with choices and ability to access this important technology. We also urge regulatory agencies in countries where biotech crops are available or under the de-regulation process, to be flexible in adopting the existing products for FAW control and to fast track the introduction of new products effective to FAW.

• Other pest management tools

Other pest control methods should be used in conjunction with pesticides as part of an IPM approach. These include agronomic practices, legitimate biological pesticides and natural enemies. CABI has been reviewing different approaches to FAW management in Africa and this work forms a strong basis for the promotion of pest management options. Farmers need to know about the efficacy and risks of pest management approaches and information on this should be

evidence-based.

CLEAR, EVIDENCE-BASED ADVICE TO FARMERS

Given that the FAW is an invasive species, there are few validated control methods available – farmers therefore require technologies that are evidence-based and cost-effective for adoption.

Farmers and those who advise them (such as extension officers and agricultural product retailers) also need clear and consistent advice. Importantly, farmers should be made aware of the danger of the pest, taught to recognize it, and informed of its ecology and lifecycle, including when it is most vulnerable to pest management options. Farmers need to be given information about pest management approaches, their efficacy, the extent to which they have been validated, and how insecticides should be applied so as to maximise their efficacy and mitigate human health and environmental risks.

For crop protection and plant biotech solutions, advice on identifying counterfeit products and

resistance management should also be provided. Governments must also ensure biological pesticides available to farmers are legitimate and do not contain hidden (unlabelled) synthetic insecticide ingredients. We expect, over time, as research is conducted, that more pest management approaches will be incorporated into the IPM strategy, in particular the use of biological control agents. Clarity and consistency are critical in FAW management.

ACCESS TO THE TECHNOLOGY

Sound regulations need to be based on science and evidence, considering not only the products' intrinsic qualities but also its purpose and condition of use. This enables regulatory decisions to weigh risks and benefits, not just hazards.

A well-functioning regulatory system will give farmers a choice of tools to protect their crop from FAW, while also protecting human and environmental health, balancing risks and benefits. Evaluations should be grounded in real use-situations and where lacking, capacity of

national and regional regulators should be increased to achieve this across Asia.

In the event of farmers' inaccessibility to crop protection solutions for FAW, the need for emergency use regulatory permits should be explored with regulatory agencies. This process is in place in several western nations (including the United States among others) and has served a critical role in guarding against the unintended consequences posed by misuse, overuse and off-label use of registered pesticides as well as the impact of illegal products.

Here is a list of suggested options for government to consider on providing access to technology/ product:

(a) Grant of temporary label expansion or government use recommendations on existing products considering efficacy, safety and resistance management principles.

(b) Allowing fast track registration for newer molecules / product mixtures which are under regulatory scrutiny or approval process, supported by international biological data against FAW.

(c) Inviting potential candidate molecules applications from the industry, for granting conditional registrations. This should consider data transportability on efficacy and MRLs from outside the country.

(d) Plant Biotechnology considerations could include the utilization of data from other jurisdictions to make more timely regulatory decisions about either existing or new products that have already been validated as efficacious against FAW in real world situations.

Strengthening law enforcement on seed technology and product security to deflect resistance and ensure durability of biotechnology products against FAW.

• Stakeholder coordination

FAW management should entail multi-stakeholder engagement with farmers, governments, service providers, NGOs and the private sector. There needs to be effective coordination of all stakeholders involved with a focus on solution-oriented dialogues.

CropLife International's member companies research, manufacture and sell crop protection and plant biotechnology products, and the global CropLife network spans 91 countries; therefore, we feel we can make an important contribution on this issue.

Advancements by our members in technology, such as pesticides, plant biotechnology and precision agriculture, will aid the ability of farmers to deal with FAW, and a collaborative and constructive relationship with the FAO, UN Environment and wider stakeholders can be used to promote optimal and responsible use of plant science tools around the world, with our collective aim to successfully meet the Sustainable Development Goals.

As one specific example of where our industry can make a contribution, in 2018, CropLife Africa Middle East was engaged as a project partner on USAID's Feed the Future project in Ethiopia to train agricultural extension staff and farmers in FAW identification and control. In February 2018, CropLife Africa Middle East trained Master Trainers from Ghana, Mali, Cote D'Ivoire and Nigeria in FAW IPM. Each trainer has an action plan to cascade the training to other trainers. More widely, the global CropLife network is working with partners to incorporate FAW IPM into existing training projects across key countries in Africa and Asia.

• Consideration of emergency phytosanitary measures for FAW

The seed industry suggests that governments considering implemen-

tation of emergency phytosanitary measures to address the risk of entry and establishment of *Spodoptera frugiperda* in their country take the following points into account when addressing any such risk associated with the importation of seed for sowing:

- assessment of risks associated with this pest are fairly straightforward when compared to other plant diseases or insect pests;
- infestation by this pest is known to spread from vegetative plant parts to ears (for corn) – risks of spread and introduction are also more prevalent through domestic and regional movement of the adults, where the moth can travel and spread;
- the degree of phytosanitary risk is therefore insignificant on seeds – for seed imports, the post-harvest stages of seed processing (which include husking, drying, shelling and cleaning) eliminate the potential for FAW larvae to survive;
- as such, the seed industry believes that it is NOT necessary to apply specific phytosanitary measures for FAW on imports of seed for sowing; and
- If phytosanitary measures are to be applied, a preferred approach that is currently in force in the European Union is that, where phytosanitary measures have not been applied to seed for sowing and grain imports of *Zea mays* to address FAW - however, an effective post-harvest treatment (or country or pest free place of production Additional Declarations) are required for the import of ears and related products.

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AN EQUITABLE WATER USE POLICY FOR INDIA



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India's net cultivated area has stabilized at around 140.1 million ha. The agricultural production system vulnerable to monsoons and markets is highly risk-prone. It is rainfed agriculture that dominates the production system, with 52 percent of the nation's cultivated land being fed by monsoons.

Water is vital for production, and hence its management assumes core concern. While the average annual rainfall of the country is about 1,170 mm, there are huge temporal and spatial variations, ranging from an average high of 10,000 mm in north east to a low of just 100 mm in some parts of western Rajasthan. Temporally, major annual rainfall is received from south west monsoons (June to September). Any related policy needs to account for both these spatial and temporal variations.

Availability of fresh water resources is of particular interest to any agrarian economy. In case of India, host to more than 18 per cent of the world's population, only 4.2 per cent of the global freshwater resources are available. The country receives annual precipitation (including snowfall) of almost 4,000 billion cubic meter (BCM), which yields into an estimated average water potential of 1,869 BCM. However, various

physiographical & technological factors limit presently utilisable resources to 1,121 BCM only. In fact, the per capita availability of water has declined sharply to 1508 m³ from 5,177 m³ in 1951, and is projected to dip further to 1235 m³ by 2050.

AGRICULTURE – A PRIORITY

Currently, water for agriculture is considered next only to drinking purpose in terms of priority. In India, it is agriculture that consumes as high as 85 percent of utilisable water. From a macro-economic perspective, given an increasingly diversifying economy, growing population and infrastructural demand, India's agriculture would need to free some water for these sectors. This has to be however realized, without in any way compromising the food security of the country and livelihoods of the farmers. Both short and long run interventions will be in order as a proper response.

India's food security has relied on wheat and paddy, both of which are heavy water duty crops. Since the launch of Green Revolution, both science and policy framework have incentivised these water guzzlers to the neglect of climate smart low water duty crops, like millets. Parallel to the stress on water budget, traditional

and nutrition-diverse consumption plate of the Indian population has faced compromise too. Other such egregious crops include sugarcane in water stressed areas.

The system suffers from low water use efficiency as manifest in alarming chasm between irrigation potential created (IPC) and irrigation potential utilized (IPU). An unpardonable 22 million ha of irrigation potential is the loss in consequence. The commonplace flooding system of irrigation is a bane that uses more water than required, besides degrading soil structure. Ground water, which constitutes 60 per cent of the irrigated area is fast depleting the aquifers built over millions of years. The villain of the piece is free or highly subsidised power made available by the states.

Most problems associated with poor irrigation management are man-created. Implicitly, solutions lie in adopting a rational and scientific management approach to water. On priority, non-cost practices, encompassing agro-ecology based crop alignment and formation of 'Pani Panchayats' deserve promotion. A system in which, the Pani Panchayats buy water on volumetric basis for distribution to farmers will check undue wastage.

The R&D should develop low water duty crops with higher yields, for a favourable inter-crop comparison. A policy tweak that pays higher for adopting low water duty crops, besides recognizing the ecological services of crops like legumes, can sustain a directional change. Well known technology suits comprising integrated farming, water harvesting, soil conservation, mulching, conservation agriculture etc. now need to be universalized, particularly in rainfed systems. What is needed is "Rain Use Efficiency (RUE)".

USE OF TECHNOLOGY

The efficiency of the conventional engineering and agronomic package can be enhanced by a complement of IT/ICT based emerging technologies. Micro-irrigation systems (drip and sprinkler) that transfer a saving of 30-50 per cent in water consumption now cover more than 11 million hectares. This adoption needs acceleration targeting a minimum of 3 million ha per annum, by mandating it compulsorily



under every system of irrigation. There now exist commercially usable technologies like sensors, drones, data analytics and artificial intelligence which can shift water use efficiency to the next higher curve. Sensors attached to the plants can read turgidity status and communicate the demand for watering to a web-based monitor on the officer's desk. The field is thereby watered only when it needs to be. Remote controlled operation of the irrigation pump is now possible using the mobile based App. In a situation where electric power is available at odd hours, economy in water use is feasible.

Science and Technology can help in enhancing productivity of water, which measured by gms/m³ are, for example, as low as 130, 106 and 138 for jowar, pulses and rice respectively. It is finally science and technology alone that can provide the desired elasticity to respond to environmental challenges.

The policy paradigm will necessarily have to weigh in favour of the basic needs of the majority in contrast to luxury of a few. Transfer of water from life needs (drinking water, production etc) to lifestyle items (golf courses, individual swimming pools etc) must be considered as unethical. Reuse and recycling of water after necessary treatment should become mandatory.

Water management deserves the highest attention to ensure its equitable availability over space and time, to reconcile the competing demands of all sectors of the economy including agriculture so that they can operate at full potential, as also for all citizens. A comprehensive water management policy for the country brooks no delay.

BAMBOO

RESOURCES FOR ECOLOGICAL SECURITY

Bamboo covers 12.8% of total forest area in India. Northeast India is particularly rich in bamboo as over half of species are found there. There are 3 large genera (*Bambusa*, *Dendrocalamus*, and *Ochlandra*) of bamboos in India with in excess of 10 species each. Together, these three genera represent about 45% of the total bamboo species found in India. Bamboos in India show a huge diversity in both their habitat and habit of growth. They are found in different forest types, ranging from tropical to sub-alpine zones. In India 156,866 sq. km area is secured under bamboo forests holding an estimated 28,103 million culms equivalent to 188,759 thousand tonnes of bamboo by weight. Madhya Pradesh, Maharashtra, and Arunachal Pradesh states are the top three as per the area covered under bamboo forests. In terms of a total number of culms; Arunachal Pradesh, Assam, and Madhya Pradesh are the top three states. While, regarding weight, Arunachal Pradesh, Karnataka, and Assam states are at the top three positions. Bamboo has a huge potential for ecological security.

CARBON SEQUESTRATION

Sequestering carbon through tree based system is currently being considered as an attractive economic opportunity for carbon trading. Due to its rapid biomass accumulation and effective fixation of solar energy and carbon dioxide, the carbon sequestration ability of bamboo is extremely high. According to an estimate, one fourth of the biomass in tropical regions and one-fifth in subtropical regions come from bamboo. Each acre of bamboo can isolate as much as 40 tonnes of CO₂. Using bamboo for construction purpose can also lead to long term storage of carbon. It is estimated that a 1,000 sq. ft. green home built by bamboo has over 15 tonnes of CO₂ locked up (sequestered) within its fibers. Therefore, by advancing bamboo based land-use systems, higher C storage can be achieved. It is concluded that carbon storage and sequestration rate of 30–145 t/ha and 1.3–24 t/(ha × yr) respectively, can be accomplished from different species of bamboo. The worldwide average carbon storage in forest vegetation is around 86 t/ha, which can be surpassed effectively by the properly managed bamboo plantation. Bamboo is required to be properly managed to achieve maximum sequestration of CO₂. As a carbon sequestration agent, it can likewise retard pace of climate change. It could be a unique and ideal ecofriendly species as carbon credits.



CONTROLLING SOIL EROSION

On account of broad shallow root system and accumulation of leaf mulch, bamboos are very effective for the control of soil erosion, stream bank protection, reinforcement of embankments and drainage channels. Bamboo grows well on steep hillsides, road embankments, gullies, or on the banks of ponds and streams. Sharp curves in rivers can be protected with a revetment of bamboo culm cuttings and further fortified with clumps of bamboo planted behind the revetment. The root system of bamboo makes it more effective for preventing erosion and landslides, protecting riverbanks and preventing floods. Bamboos can reduce erosivity of runoff and erodability of soil through dispersal of rainfall energy by canopy, surface litter, obstructing overland flow and root binding. Bamboos protect riverbanks by arresting strong currents during flood periods by their extensive fibrous root system. Bamboos have an interlocking rhizome system and extensive fine fibrous root system which ramifies horizontally and vertically binding the soil particles together. For instance, the root of *Bambusa tulda* can extend horizontally to a distance of about 5.2 m. Their root mats are tightly woven, that has a significant capacity to bind the top soil. With its extensive root system, it can conserve soil by preventing the erosion.

CONSERVING WATER AND WASTE WATER UTILIZATION

It conserves water in catchments areas, controls floods in valleys, plains and limit siltation. Bamboo is very much successful in protection of sea banks, river banks, dam sites and canal banks. It is planted along streams and river banks that grow particularly well due to abundant and even supply of moisture. As a result, the soft banks are bounded by fibrous mass of roots and the thick culms arrest strong currents during flood periods. Additionally the bamboo forest is an ecological wastewater utilization system that comprises of a subsurface evaporation –transpiration bed planted with bamboo and other rapid growing, non invasive plants. This system provides an aerobic rhizosphere in which damaging polluting components are changed into plant nutrients.

SUBSTITUTING WOOD

Bamboos have extreme potential for substituting wood. It can be used for plywood, various board products such as block board, wafer board, strip board, laminated boards, roofing sheets; earthquake-resistant housing and buildings; bridges, culverts, retaining walls, telephone/electricity poles; furniture; fuel-wood, charcoal and briquettes, active carbon; matchsticks, agarbattis, toothpicks, skewer sticks, etc; schooling: pencils,

rulers, blackboards; pulp and paper, particle board, MDF, handicrafts etc. It is strong and makes strong, elegant, lightweight and eco-friendly furniture. Bamboo is suitable building material for earthquake-prone areas due to its high elasticity. The performance survey conducted after many earthquakes concluded that wood-frame construction could withstand the effect of large earthquakes without serious damage. The additional advantage of using bamboo is its fire resistance property due to the high content of silicate acid. Bamboo is a great ingredient for the environment-friendly interior from the aesthetics point of view. The usage of harmful paints can also be avoided due to the naturally shining skin of bamboo.

MAINTENANCE OF SOIL HEALTH

Bamboo is a fastest growing species in the world. The growth rate ranges from 30 to 100 cm per day in growing season. Due to its fast growing nature, it can produce huge biomass in short span of time. Due to high biomass accumulation and abundant litter fall, bamboos help in maintaining and improving the soil physical, chemical and biological properties. Bamboos have high silica, rich litter production of leaves and twigs which slowly decompose returning substantial amounts of N, K, Mg, Ca and P. The high fine root

content helps in recovering large portion of the nutrients leached deeper in the soil profile. Improvements are also reflected through lower bulk density, lower surface resistance to penetration, expanded porosity, higher rain water infiltration and greater aggregate stability. Canopy shade also alters soil conditions to promote microbial activity and the rate of soil mineralization. The changes/enhancement in soils are however, species-specific and dependent on size and age of the clump and site conditions.

GENERATING ENERGY FROM BIOMASS

Bamboo can be used to produce Bio-energy, which is considered to be GHG neutral. Bamboo can be used to produce producer gas through gasification that can be used to produce electricity. Bamboo has got huge potential to bring revolution as a bio energy resource and considered as the best amongst other known biomass resources. It can meet both thermal as well as electrical energy requirements and thereby provide energy security to the rural people. At present, conventional fossil fuels like coal, oil, etc. have been mostly used but their shrinking source, limited storage and polluting nature have forced to look for alternatives. Bamboo has got potential to tide over this problem and ensure energy security. Some of the varieties of bamboo grow so fast and take 3-5 years verses 10-20 years for most softwood and processed for thematic uses, and the unused part can be used for generating power along with other energy purposes.

MAKING BIOCHAR

Production of biochar from bamboo culms and bamboo products at their end of life is a great alternative of carbon sequestration and improving the soil health. Pyrolysis can convert up to 50% of the carbon from plant



tissue to biochar. The remaining 50% carbon can be converted into energy. Due to its high surface area, biochar has the ability to retain nutrients for a long time. It helps in increasing water availability for plants with potential benefits to microorganisms. Biochar has the retention time on soil up to thousands of years. In addition to holding carbon, biochar also adds much -needed macro and micro nutrients (P, K, N, Ca, Mg, Cu, Zn, Fe, Mn) to the soil. Biochar helps in reducing emissions of nitrous oxide (N_2O), a greenhouse gas from the soil. Adding biochar can also enhance composting process. Numerous associations are working for the incorporation of biochar as Climate Change Mitigation (CCM) technology. The issue has been discussed on many forums of UNFCCC. However, the potential inclusion of biochar as a CCM technology within the UNFCCC stays uncertain.

At present, the world is facing a serious problem of depletion of natural

resources. In India, the livelihoods of rural people are particularly at risk due to depletion of soil and water resources as a major share of productive land has become unproductive due to topsoil loss from erosion. Moreover, global warming is also becoming a major issue for developing countries. There is a pressing need to find ways to address these problems. Bamboo serves as a best option to address these challenges. Many studies suggest that bamboo plantations could mitigate carbon dioxide from the atmosphere more effectively than any other species. This will hopefully help to go a long way in mitigating the erosion of biodiversity and climate change. That will serve as best resource in ecological prospect.

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• कार्बोथायोनाइड • कीटनाशक • फंगीनाशक • उपजर्धक

रहिमन पानी राखिये, दिन पानी सब सून । पानी गये न ऊबरे, मोती, मानुष, धून ॥

वर्षे पड़ते से हमारे पूर्वज
पानी के महत्व का वर्णन कर गए हैं ।

पुराने समय में पानी का स्रोत
नदी, कुएँ, झरने इत्यादी हुआ करते थे
और पानी का उपयोग
आवश्यकता अनुरूप होता था ।

आज आधुनिकता के दौर में
हम जमीन से ज़रूरत से ज्यादा पानी निकाल रहे हैं,
जो उपयोग कम और बर्बाद ज्यादा होता है ।
जिससे भू-जल दिन प्रतिदिन कम हो रहा है
और कुछ सालों बाद शायद पूरा ही खत्म हो जाये!

अब सवाल उठता है
कि हम हमारी आने वाली
पीढ़ी के लिए कितना पानी छोड़ना चाहेंगे ?

इस परिस्थिती को भांपते हुए
धनुषा ने 2005 में नारा दिया था,

"खेत का पानी खेत में – गांव का पानी गांव में"
बचाये पानी की हर बूंद ।

आप भी पानी बचा सकते हैं...
अपने घर में, स्कूल में, फीकट्री में, संस्थान में, गाँव में....
अधिक जानकारी के लिए कृपया सम्पर्क करें
savewater@ghanuka.com



खेत का पानी खेत में



बचाये पानी की हर बूंद

गांव का पानी गांव में



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FOOD FRONT FOR INDIA

Towards poverty reduction and attaining agrarian prosperity in India



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The latest farmers' welfare gesture by Government of India (see box-1) is noble and absolute. Let us acknowledge it, being a positive government intervention, without questioning its relevance or the adequacy of direct monetary support pledged for. It is, however, vulnerable to any arbitrary criticism and comments. For instance, some world critics may possibly call it a lavish and avoidable expenditure, and some others suspect it to be detrimental to the level playing field at the world trade organization. While within the country, on the other hand, government may be knocked at by some farmer or other stakeholder representatives asking for even bigger annual amount of such minimum direct support. Here, two key questions arise; (1) why a dilemma over genuine welfare measures being taken by a Welfare State? (see box-2), and (2) how this earnest push for farmers' minimal economic uplift vis-a-vis empowerment may be taken forward to help mitigate the agrarian distress, remove poverty, and achieve long term agrarian prosperity?

Agriculture sector is perpetually creative yet, at the same time, destructive human interventions in nature are also attributed to the evolution of agriculture. It is a key example of how humans have destroyed

forests to settle for and expand area under cultivation, farming and grazing. Over the last three centuries, when population has jumped by over 1000 per cent from mere 65 crore in 1700 A.D., the area under agriculture increased just half the way, i.e., by slightly above 500 per cent. There was a corresponding reduction the world over of about 20 per cent forest cover, thereby inadvertently leading to shrinking of substantial carbon sink on the earth planet.

Huge success in industrial agriculture, producing more from less cultivated land, is noted in advanced industrial economies in Europe and America, thanks to technology and innovation. But land resources per caput are continuously shrinking the world over due to population increase and multiple economic activities. Trends in urbanization and migration are also challenging the agriculture sector by and large.

Nevertheless, subsistence farmers in rural and tribal areas hold the key as they account for nearly 60 per cent of the agricultural land use, and provide up to 20 per cent of the world's food. Even in this era of changing agricultural landscapes and diminishing on-farm biodiversity, we still expect the traditional farming areas to have adequate soil health, landscape richness, aesthetics in cropped areas, farmsteads, and grazing lands, biodiversity of cultivated landscapes,

BOX-1: STEPS TOWARDS FINANCIAL STABILITY OF FARMERS

Union Cabinet 2019-2024 in their very first meeting after taking oath on 30th May 2019 reconfirmed an increasing priority to work for the welfare of Indian farmers. Major opening cabinet decisions included, (i) extending the coverage of minimum annual income support to farmers under Pradhan Mantri Kisan Samman Nidhi (PM-KISAN) scheme to all land owning farm families, (ii) creating a new insurance-linked pension scheme for farmers and small traders, and (iii) controlling foot and mouth disease and brucellosis among all types of livestock.



BOX-2: INDIA - A WELFARE STATE

Nation is pledged to provide equal opportunity for all citizens as per the Constitution of India, In recent times, Union Government has expressly committed to farmers' welfare and *sui generis* protection of their rights, while also pushing the economy to grow in a globally competitive mode. The central agriculture ministry is renamed to simultaneously administer farmers' welfare. The protection of plant varieties and farmers' rights authority is exhorted to create further opportunity for them by effectively implementing the *sui generis* protection of their rights. And now, a new Ministry has been created to take care of the welfare of animals, fisheries and their farmers.

folk varieties, and other agriculturally important species and races of organisms dwelling in soil and air or those harboring on plants and animals. The array of subsistence farming niche also constitutes the potential treasure house of economic activity centered on ethnic and geographical goods as well as the ecosystem services. The agriculture and farming activities under subsistence farming by and large do have profound impact on sustainability of the ecosystem functions on earth planet vis-à-vis healthy living.

Multi-functionality of agriculture is a concept that may potentially provide alternative policy options in the process of justifying welfare interventions aimed at long term agrarian reforms. Subsistence farming has intrinsic linkage to the concept of multi-functionality defined for the first time by the European Commission in 1999. It recognized three different functions of agriculture broadly; (i) production function (producing food and other agricultural commodities, market outputs), (ii) environmental function (preserving rural environment and landscape, externalities, non-market outputs), and (iii) socio-economic function (contributing to the viability of rural areas and a balanced territorial development, externalities, non-market outputs). Further studies are also available that provided alternative classification from trade prospects, for example, green functions, blue services, yellow services and white functions of agriculture. The subsistence farmers' contributions over the generations



in making conscious or sub-conscious selections for adaptability, resilience, tastes, and other preferential traits in the local landraces and folk varieties of crops or animal breeds renders it another unique function emerging from farmer-agriculture-biodiversity intimacy.

With the current state of knowledge and understanding of these facts, subsistence farmers deserve to be compensated on equitable benefit sharing basis *in lieu* of their contributions to conservation of biodiversity for sustainable use and environmental harmony. Government's direct monetary support to farmers is thus justifiable as well as accountable. Economists may need to *de novo* engage themselves towards working out finer details of such justification. Ideally, it may be wise to project 'minimal economic uplift and empowerment of subsistence farmers in order to remove poverty and attain agrarian equality' as a substantive public objective that is to be achieved by the new farmers' welfare initiatives.

Government's direct monetary support to farmers is thus justifiable as well as accountable. Economists may need to *de novo* engage themselves towards working out finer details of such justification

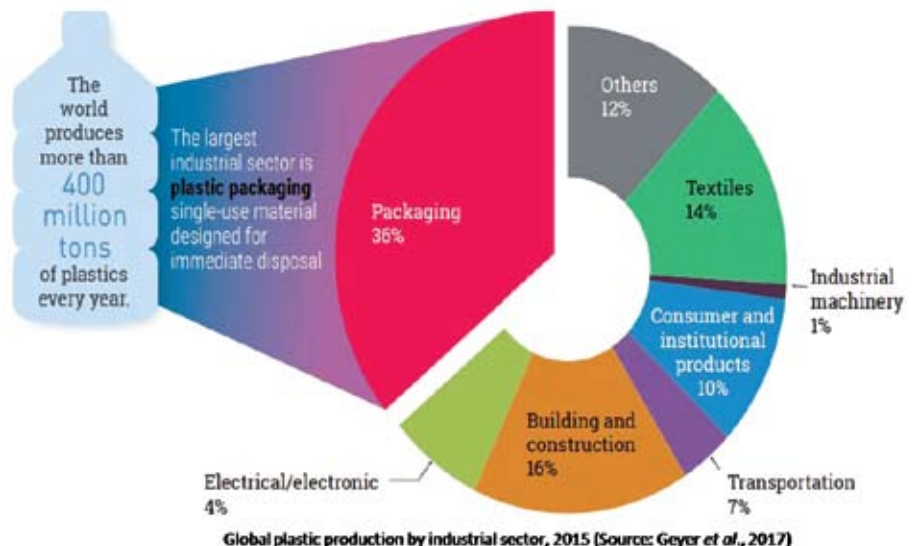
EDIBLE PACKAGING

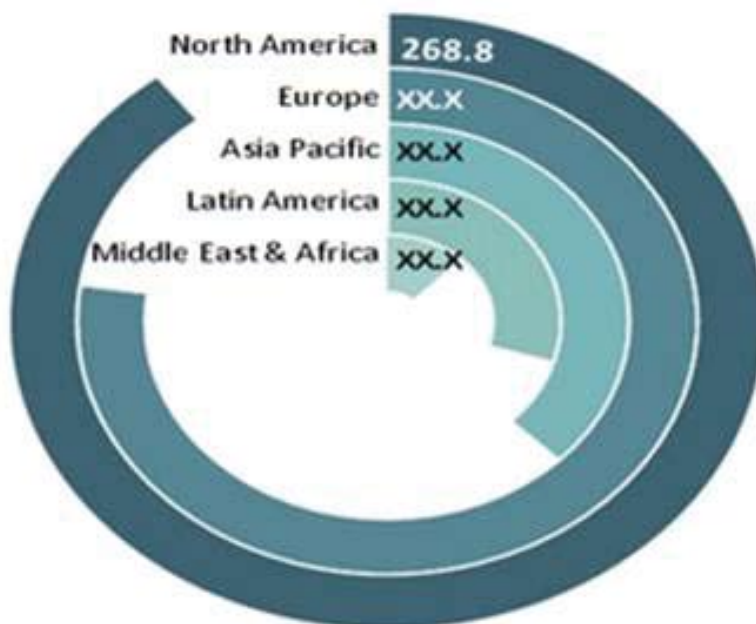


accounted for 47% of the plastic wastes generated globally, with half of that appearing to come from Asia. While China is the largest worldwide producer of plastic packaging waste, the USA is the largest generator of plastic packaging waste on a per-capita basis, followed by Japan and the European Union.

There is an alternative to plastic packaging. The fundamental aspects of all packaging materials is that in an economic manner, they must contain, preserve, protect, inform (throughout the entire transportation and distribution process from point of manufacture to aspects of consumer usage) and provide convenience (at many different levels) while acknowledging the constraints placed upon their usage from both

There has been a massive surge in awareness of the damage that plastic pollution does to our planet in recent years. The world's annual utilisation of plastic materials has increased from approximately five million tonnes in the 1950s to nearly 230 million tonnes today. The total production of plastics in Europe was about 57.5 million tonnes in 2005, representing 25% of the total worldwide production of 230 million tonnes, at similar levels to that of North America, at 24%. Plastic packaging waste





Global edible packaging market revenue by region, by 2015 (US\$ Mn)

Source: www.alliedmarketresearch.com

legal and environmental perspectives. The essential functions of packaging are protection, containment, information and convenience. Apart from preservation, packaging also has secondary features such as selling and sales promotion, which contributes significantly to a business profit. Concerns with the negative impact of traditional food packaging materials on the environment and the need to reduce the loss of fresh food through degradation is driving the quest for alternative to conventional packaging materials and formats; primarily plastics, metals, paper, or glass laminates.

Nowadays the majority of food packaging

materials and formats consist primarily of laminates which can be comprised of plastics, metals and paper and glass. The most common plastics are: Polyethylene Terephthalate (PET), Polypropylene (PE), Low Density Polyethylene (LDPE), High Density Polyethylene (HDPE), Polystyrene (PS), Expanded polystyrene (EPS), Polyvinyl-chloride (PVC), Polycarbonate, Polypropylene (PP); Polylactic acid (PLA) and Polyhydroxyalkanoates (PHA). These materials have been traditionally manufactured and engineered for specific food packaging applications. However, consumer demands are changing concerning food product purchasing, and

Plastic packaging waste accounted for 47% of the plastic wastes generated globally, with half of that appearing to come from Asia. While China is the largest worldwide producer of plastic packaging waste, the USA is the largest generator of plastic packaging waste on a per-capita basis, followed by Japan and the European Union



consumers are becoming more aware of the presence, role and implications of the food packaging that surrounds their retail food purchases.

Additionally, most of the packaging used today are synthetic and has been derived from fossil fuels (from natural gas) for over half a century. Commercial usages of such forms of packaging materials for food have relied on an abundant supply of low-cost packaging materials. However, there are now global concerns about the depletion of nonrenewable raw materials for manufacturing plastics. The global economy is rapidly facing the scenario that higher oil demands are being met with falling supplies. Food packaging is a significant part of that total and thus even a small reduction in the number of materials used for each package would result in a considerable cost reduction and may improve solid waste disposal. The current trend in new food packaging materials development is that, wherever possible, it should be not only natural and environmentally friendly but also functional and cost-effective. Thus, the development of edible or biodegradable coatings for adequate food packaging has generated considerable interest in recent years due to their potential to reduce and replace conventional, non-biodegradable plastics. As food manufacturers require packaging materials to be food grade, maintaining and also enhancing product safety, shelf-life stability and utilize nominal values of packaging, the reduction or replacement with alternative biodegradable forms would allow improvement in overall operating costs, while reducing waste streams. European Union regulatory pressures, coupled with indirect demands via consumer groups on European Union food processors and packaging manufacturers, to develop environmentally friendly packaging systems are increasing.

CONSUMERS DEMAND ECO-FRIENDLY PACKAGING

SOLUTIONS

One such alternative is the use of packaging that is made from edible materials from food grade or underutilized food ingredients. As traditional food packaging materials show limitations in terms of their environmental pollution impact and their manufacturing demand for non-renewable resources, the need for novel packaging materials and packaging formats is now required more than ever. A significant group of alternative materials which possess future commercial potential are those derived from utilized and underutilized food ingredients, or food grade ingredients. Consequently, the need of the time is to explore packaging materials which are not just biodegradable, but which are edible also, thereby presenting more significant opportunities for commercial uses more sustainably.

Edible films are defined as a thin layer of material which can be consumed and provides a barrier to oxygen, moisture and solute movement for the food. Global Edible Packaging Market was valued at \$697 million in 2016 and is projected to reach \$1,097 million by 2023, growing at a CAGR of 6.81% from 2017 to 2023. Edible packaging has witnessed increased adoption owing to factors such as high consumption of processed food products, rise in hygiene concerns among people, an increase in packaging waste by the usage of synthetic polymers thereby affecting the environment, which boost the edible packaging market growth (www.alliedmarketresearch.com)

Edible packaging is rapidly advancing by utilising digestible compounds, such as proteins, polysaccharides, lipids and resins, and other consumable components, derived from diverse renewable sources. Such edible packaging materials are intended to be integral parts of food products and to be eaten with the products. Thus they are also inherently biodegradable

in composting and other means of biological recycling. These biopolymers can be classified into four general categories: polysaccharides, proteins, lipids and polyesters (obtained by controlled vegetal or bacterial biosynthesis). Films primarily composed of polysaccharides (cellulose and derivatives, starch and derivatives, gums, etc.) or proteins (gelatin, zein, gluten, etc.) have suitable overall mechanical and optical properties, but are highly sensitive to moisture and show poor water vapour barrier properties. In contrast, films composed of lipids (waxes, fats or derivatives) or polyesters (polyD-, B-hydroxybutyrate, polylactic acid, etc.) have excellent water vapour barrier properties but are usually opaque and relatively inflexible. Lipid films could also be quite fragile and unstable (rancidity). Edible packaging generally consists of edible films, sheets, coatings, and pouches. Edible films (thickness <254µm) or layers (thickness >254µm) are stand-alone structures that are performed separately from the food and then placed on or between food components or sealed into edible pouches, whereas edible coatings are thin layers of consumable materials formed directly onto the surface of the food products. Soft-gel capsules, hard-gel capsules, tablet coatings, and microcapsules made from edible materials could also be considered edible packaging. Edible packaging can be in the form of an edible film, coatings, and pouches.

ADVANTAGES OF EDIBLE PACKAGING

The unique benefits and versatility of edible packaging materials are envisioned to create green, innovative packaging for reducing waste and for improving product stability, quality, safety, variety, and convenience for consumers.

The main benefit of edible packaging films over traditional synthetics is that they can be consumed with packaged products.

There is no package to dispose of even if the films are not consumed; they could still contribute to the depletion of environmental pollution. The packaging materials are produced exclusively from renewable, edible ingredients and therefore are anticipated to degrade more readily than polymeric materials. The edible packaging material can enhance the organoleptic properties of packaged foods provided they contain various components (flavourings, colourings, sweeteners). The application of edible films can be inside heterogeneous foods at the interfaces between different layers of components which again possess the potential of tailoring to prevent deteriorative inter-component moisture and solute migration in foods. These films can carry antimicrobial and antioxidant agents. Having the possibility of use as multilayer food packaging or/and surface packaging by which the transfer rate of additives from the surface to the interior of the food can also be controlled. Manufacture of edible films produces less waste and pollution.

LIMITATIONS OF EDIBLE PACKAGING

Poor physical characteristics (no mechanical strength of lipid-based films) of the edible film limit its application. By laminating, edible/biodegradable films with multiple functional layers have the potential to overcome these shortcomings.

Edible packaging based on water-soluble proteins possesses excellent gas and flavour barrier properties. Proteins help in a cohesive, structural matrix in multicomponent systems, yielding films and coatings with excellent mechanical properties. Lipids, on the other hand, act as moisture barriers but have poor lipid, gas and flavour barriers. By combining proteins and fats in emulsion or bilayer (a membrane consisting of two molecular layers), the positive attributes of both can be united and the negatives minimized.



From the research conducted by the Food Packaging Group at UCC, the general characteristics of developed edible or biodegradable films are as follows:

- The thickness of manufactured edible or biodegradable films range from 25 μ m to 140 μ m
- Edible films can be clear, transparent, and translucent or opaque depending on the ingredients used and the processing technique employed.
- Ageing specific film types under controlled environmental conditions improved mechanical properties and gas barrier properties
- Storing films at ambient condition (18-23°C, 40- 65% relative humidity) for five years did not significantly alter structural characteristics the edible films formed from various ingredients can be relatively easily laminated together.
- Manufactured films can be labelled, printed on or heat sealed

However, edible packaging materials are not normally meant to replace conventional packaging entirely. Rather, the efficiency of food preservation can be improved

by using primary edible packaging together with nonedible packaging as secondary packaging to add additional protection from the atmosphere and prevent contamination from microorganisms or foreign particles.

In spite of the bottlenecks, the scope in the field is enormous. Large number of startups are entering the field and making an attempt to revolutionize agriculture. Today it has become an imperative need in India to design a road map and prepare a framework to increase digitization of agriculture not only for large farmers, marginal and small farmers as well to enhance productivity and sustainability. A detailed study is needed to analyze, understand and interpret various information, data and trends of digitalization in Indian agriculture as well as the shortcomings. This will provide a basis for taking informed decisions, both related to policy and business strategy as a whole for increasing digitalization for feeding growing population with limited resources and making agriculture profitable and sustainable simultaneously.

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RURAL MANAGEMENT

Providing Opportunities beyond Agriculture



Agriculture forms the core of employment in rural India, however the contribution of the sector to national income has been shrinking over the last few decades. The rural economy though as a composite, contributes close to half the GDP in India. As per estimates, the rural market for FMCG goods alone will cross \$100 billion by 2025. Rural households contribute to approximately 50% of the GDP, 40% FMCG sales, 50% two-wheeler sales, 30% four-wheeler, and 45% telecom contribution, according to a report by Deloitte and FICCI (2018).

In this scenario, all the companies are competing with each other for an enduring presence in Rural India. Large corporate houses are making their products, keeping in mind the rural population of India. The government is increasing focus on rural development, both on income and expenditure side. Rural Market, therefore, is lucrative choice for the

companies.

There is a need for industry professionals to train themselves about the new rural India, its aspirations and ability for higher consumption levels. With distinctive consumer profiles and availability of infrastructure, marketing strategy for rural markets would be different than the urban market. Industry therefore will have to be responsive to the specific needs of this sector, rather than replicating urban products, services and channels into rural markets.

However, one of the common challenges many companies face and which is affecting the profitable growth of businesses in the rural areas are limited talent. To manage this huge untapped market companies are looking for professionals who can measure the pulse of rural market aptly.

AGRICULTURE EDUCATION

Agriculture education in India is at a cross-road, as the gap

between the aspirations and reality of career pathway of agriculture graduates widens. Majority of the agriculture graduates still aspire for a government job, but in reality, the number of such jobs is decreasing due to stiff competition and changing government policies in the era of globalization and privatization.

With agriculture still playing a major role in rural India, corporate recruiters prefer candidates who have an understanding of the agricultural income cycles of the rural people because this understanding is pivotal in knowing the rural people as consumers of their products and services. This applies to varied range of products and services, apart from agriculture related ones. Agriculture graduates have a definite advantage here, as their curriculum covers not only the subjects such as agriculture economics and agriculture finance, but also the courses such as 'Rural Agricultural Work Experience' (RAWE) which render a practical exposure to rural agricultural realities.

The career aspiration spectrum of the agriculture graduates across the colleges shows a wide range of career options. However, the aspirations and the so called 'dream jobs' predominantly centre around few options such as government sector jobs (both agri and non-agri), the banking sector and private sector jobs. It has been observed that the career opportunities awareness within the private sectors among agri graduates is minimal. However, corporates are looking forward for recruiting such managers for the expanding rural markets.

This is where education in well established area of Rural Management comes in handy.

CAREER OPPORTUNITIES FOR AGRI GRADUATE IN RURAL SECTOR

India is the second largest fruit producer in the world. The Food & Grocery retail market in India was worth US\$ 380 billion in 2017. Indian Government has also focused on the agri sector growth through policies and schemes like PM Kisan Samman Nidhi Yojana and 'Pradhan Mantri Annadata Aay Sanrakshan Abhiyan' (PM-AASHA) that target accelerated agri growth in the country.

With these interventions, the agri-allied sector along with food processing industry is ready for an accelerated growth in a short period of time. Opportunities therefore, will also grow exponentially with increasing number of skilled management cadre required to grow and manage these interventions. While agricultural education allows for deep technical knowledge of the sector, a well rounded look at rural as a sector inclusive of Agriculture and all supporting sectors like banking, FMCG, IT will be beneficial moving forward. Add to this, the focus on management as an input makes Rural Management Education a viable option for Agriculture graduates.

Rural management is the study of businesses for and of rural community



Rural Management students during village fieldwork learn about rural consumers' aspirations and growth opportunities

in the areas of agribusiness and allied fields, FMCG, banking and finance, manufacturing, technology and innovation, development and many more. It merges the knowledge of management studies with rural context. There are many specialised schools in India today that offer Rural Management Programmes as 2 year full time courses. Institute of Rural Management, Prin. L.N. Welingkar Institute of Management Development and Research at Mumbai (WeSchool), Xavier School of Rural Management are some of the best known amongst such schools. Some of these programmes, like the one at WeSchool seamlessly combine Management education with technical knowledge of agriculture, hands on experience in the field and interdisciplinary focus like Rural Marketing, Rural consumer Behaviour and Priority sector lending and Microfinance.

There is a need to anticipate rural beyond agriculture as it is a huge untapped market. With deep understanding of core issues of agriculture and allied sectors, the agri graduate can be ideal for Management education in the rural space. The mindset, knowledge and skill set already with agri graduate gives a jumpstart in a rural management programme and hence opportunities

available to such a post graduate also becomes multi-fold. The willingness and ability to travel, empathy for the farmers' communities and technical knowledge of agriculture are the key competencies that usually differentiates agri graduates during and after rural management education.

Agri graduates will therefore as Rural Managers have bright and accelerated career prospects, like in sectors growing in the rural space like Banking & Finance, Insurance, FMCG & consumer durables, IT & ITES, Telecom, Manufacturing, Agri-business and allied services, Healthcare, Energy, Retail, Infrastructure and many others. There is need for a large number of rural managers who have the requisite skills and competencies to create, manage and grow rural businesses for rural facing companies, cooperatives, development sector organisations and government agencies and thereby become potential agents of change for rural India.

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Associate Dean-Rural Management
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Research (Weschool)

SALEM RR BIRYANI - FOOD FOR ALL



It is no uncertainty that Biryani today is one of the most beloved dishes in our nation. It can unite individuals, all things considered, religions, and culture. This dish has come a long way, crosswise over numerous nations and has consequently advanced a great deal.

Luring people from every aspect of the social structure, breaking barriers and developing a bond that is as firm as an anchor to the ground, Salem RR Biryani is a beloved chain of restaurants that serves up some of the best biryani in Chennai. Politicians, celebrities and thousands of Chennai residents alike love the restaurant for its scrumptious food and unmatched quality. Today Salem RR Biryani is known for serving fresh, healthy and flavorsome food that can be enjoyed by people of all ages.

The story of Mr. Tamil Selvan, Founder of Salem RR Biryani is the perfect rags to riches journey and is nothing short of a heroic movie.



Around 48 years ago, a 13-year-old youngster, Mr. Tamil Selvan, who could not study beyond class four due to financial difficulties at home, decided to build a life for himself.

Mr. Tamil Selvan's childhood was replete with struggles and challenges, which provided ample opportunities for his entrepreneurial skills to come to the fore.

THE JOURNEY TO SUCCESS

Born in Edappadi, a small village in the district of Salem, Tamil Selvan

Raja came up the hard way, from his first job as a cleaner in a tea shop, washing utensils, wiping tables and taking care of the shop's cleanliness, to later working as a shepherd. His family circumstances had begun to worsen, but the desire to succeed in life was too overwhelming to give in to emotions.

He left for Chennai and started selling idlies on a push cart. Having done all petty and trivial jobs until the age of 23, he accumulated a revenue of barely Rs. 8000. It just took a few years to figure out his calling, when as an inquisitive learner, he quickly grasped and learnt the techniques and skills of cooking Biryani in no time.

His innate entrepreneurial skills, passion for cooking and experience as a biryani master under a veteran cook, Kurana Bai, gave him the confidence to start a venture of his own. In 1998, he started selling Biryani on a thallu vandi (pushcart)

selling close to just 5 kgs of Biryani a day in Guduvancheri, a small district in Chengalpattu, Chennai. He had his eye set on something much bigger, something he hardly dared to dream of, but he set about working towards it.

Today, he is the owner of Salem RR Biryani, a popular chain of biryani outlets in Chennai, with 21 branches selling 17000 – 20000 kgs of Biryani every day.

INITIAL CHALLENGES FACED

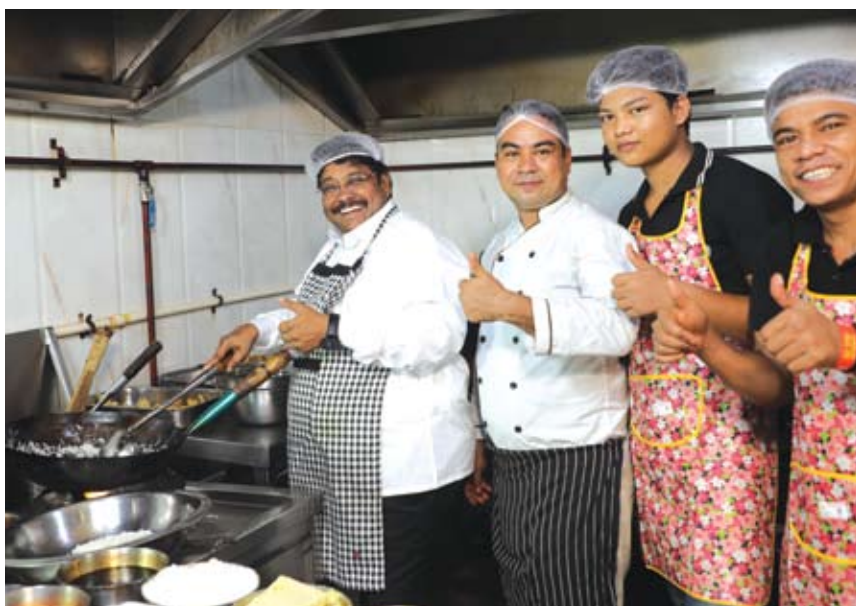
The founder Mr. Tamil Selvan, a man of humble origins, started the now-popular chain of restaurants through hard work and persistence. While trying to build a life for himself in Chennai, he faced many struggles. He recalls having starved all day to save up on some money.

"It was my love for cooking, the desire to achieve something big in life, hard work, and my self confidence that contributed to my growth," says Mr. Tamil Selvan, who is now on a rapid expansion mode.

LOOKING BEYOND CHALLENGES

He arrived in the city with nothing but his passion. Although his initial years were filled with many hardships, he was never heard of complaining or protesting about his struggles. He always remained humble. This positive approach to life has been responsible for his love of community and his big heartedness.

Tamil Selvan is highly regarded by the people of Chennai. While outsiders might know him as a businessman and owner of the popular Salem RR Biryani restaurant, those close to him know him to be a kind, strong-willed and generous individual. He ensures that his employees are well paid and takes the time to form an individual relationship with them. From mentoring them on the best way to manage their finances to helping them out in times of need, his relationship with his team extends well beyond that of a boss and employee.



PEOPLE-ORIENTED AT ALL TIMES

His generosity extends beyond his immediate team. Despite having gained riches over the years, he stayed connected to his roots. As part of his business motto, he ensured that people at every step of the process earned their fair share and were treated with respect. The ethical approach to work, selfless generosity and strong personal values made him a highly respected member of the society.

Over the years, he has helped countless people from across the world. From paying the medical fees for Sri Lanka refugees to helping

migrant workers, supporting their families and assisting those in need. As someone who had faced many difficulties in his youth, he is committed to helping others overcome their struggles.

TRUE TO THE SUSTAINABLE DEVELOPMENT GOAL OF ZERO HUNGER

Naturally imbibed in him, Mr. Tamil Selvan has always followed the Sustainable Development goals of Zero Hunger and maintaining Good Health & Well-being. Mr. Tamil Selvan aims to end hunger and ensure access by all people, in particular the poor and people in vulnerable situations,



including infants, to safe, nutritious and sufficient food.

Believing that hunger is the first lesson that a child learns, he ensures to spread his kindness through Biryani from his restaurant, which is distributed across various temples across Chennai as Prasadam feeding at least 150 people on an every day basis. All staff working at his restaurant are entitled to eat and take home some food for their families. "I consider God to have chosen me to serve the people and achieve a Hunger Free world through my food", says Mr. Tamil Selvan.

PROVIDING FOOD SECURITY AND IMPROVED NUTRITION

With an aim to end all forms of malnutrition, he says the food that is prepared at Salem RR Biryani is authentically cooked maintaining strict nutritional values. Biryani is an excellent source, because the basmati rice in it will provide the carbs while the meat becomes a source of protein. The vegetables used in Biryani will give you all the vitamins and minerals you need. With all the nutritional values, the time for the body to break

down the food is comparatively lesser and is easy to digest.

The mantra for both his cooking and his business is Quality. "The ingredients are of the best quality. The crowds came to me because I maintained quality. I would never compromise on quality, irrespective of the prices of the ingredients," says Mr. Tamil Selvan.

AID TOWARDS AGRICULTURE AND FARMERS

With an increased demand for his Biryani, Mr. Tamil Selvan is confident of being able to create a demand in other countries and play a key role in the transition towards sustainable intensification of agriculture. Cash crops, dairy products and other ingredients used in his restaurants will increase the value and offer income and employment opportunities to farmers and upgrade the rural economy.

DEMAND DRIVEN & FOOD FOR ALL

With a view to provide the experience of a good biryani to a larger section of people, Salem RR Biryani is

operational at various malls like Saravana Stores at Padi, Pothys at Salem, Jeyachandran Textiles and Ascendas - IT Corridor. Providing Budget Biryani at these places, he aims to satisfy their hunger and yet not affect the business of his competitors.

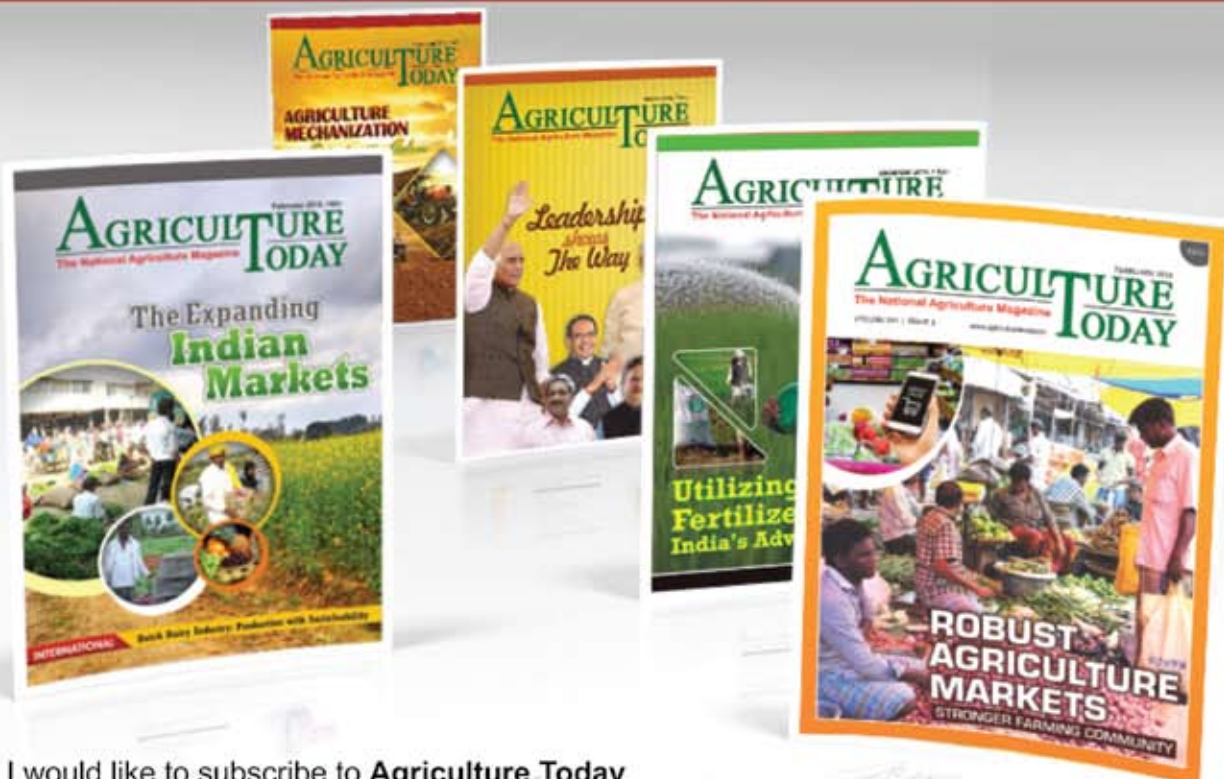
CARVING A NICHE FOR HIMSELF

A self-driven community man, Mr. Tamil Selvan has never been discouraged by naysayers. He strongly believes that if people work for themselves and stop envying others, they will be able to move ahead in life. "One has to help those in need, instead of being blinded by greed", he says.

Striving to maintain a clear conscience, his philanthropic spirit and business savvy mindset have not only benefited him, but also his community, making him the Man he is today.

His positive outlook towards life and his dedication to improving the living standards of himself and those around him has helped him achieve admirable success in life.

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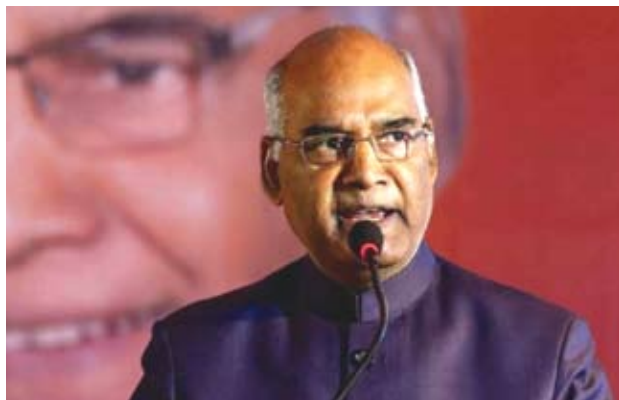
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**AGRICULTURE
TODAY**



“Only on the foundation of a strong rural economy, it is possible to build a strong national economy. Our farmers are the pillars of rural economy”

RAM NATH KOVIND
President

“Fisheries, animal husbandry, horticulture and cultivation of fruits and vegetables need to be focused to realise the government’s commitment to doubling farmers’ income by 2022. There is need for structural reform in agriculture for higher corporate investment, better logistics and ample market support for farmers”

NARENDRA MODI
Prime Minister



“Addressing the agriculture sector’s concerns is the government’s top priority as the key to eradicate unemployment and poverty lies in development of agriculture and allied sectors, including non-farm sector”

NIRMALA SITHARAMAN
Finance Minister

“There has to be accountability for performance (targets) in banks with respect to the farm sector. The state government is paying banks amounts that have been waived off. Decisions taken at top levels do not seem to be percolating to people working at bank branch levels”

DEVENDRA FADNAVIS
Chief Minister, Maharashtra

