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HORTICULTURE & MICRO IRRIGATION

COMPLEMENTING EACH OTHER

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HORTICULTURE – A BRIGHT SPOT IN INDIAN AGRICULTURE

India has witnessed voluminous increase in horticulture production over the last few years. Significant progress has been made in area expansion resulting in higher production. Over the last decade, the area under horticulture grew by about 2.7 per cent per annum and annual production increased by 7.0 per cent. India witnessed sharper increase in acreage in horticulture crops compared to food grains over the last five years. Horticulture has emerged as a bright spot of Indian agriculture.



While the increased production statistics point to the adoption of better agronomic practices and crop protection techniques, there is one critical area that has been overlooked for years. Price volatility has been the bane of Indian agriculture system. The issue is particularly critical for perishable commodities like fruits and vegetables. The recent farmer protests in different parts of India is also symptomatic of the anomalies existing in the agriculture marketing system. The arcane methods for storage with scant regard to the quality parameters have resulted in spoilage and distress selling. In the absence of a sound storage infrastructure and most importantly a post harvest plan, excess production has always spelt doom for farmers. Technology intensive options must be explored to fully utilize the production potential of the country.

Horticulture being a high value industry has also seen application of many new technologies. Microirrigation systems have evolved into indispensable components to guarantee productivity and sustainability in agriculture systems. Unlike the conventional irrigation which is labour intensive, micro irrigation is water efficient, a reason why government is promoting this system of irrigation. Some of the advantages of micro irrigation are saving of fertilizers upto 30%; increase in yield upto 100%; saving of water upto 70%; prevention of weed growth; saving of energy; and a palpable improvement in the quality of produce.

India, with a total arable area of 140 million ha with almost 42% of arable land irrigated, has a huge potential for micro – irrigation. Task Force on Micro – Irrigation (2004) estimated a potential of 27 million ha for drip irrigation based on the area under crops most suitable for that form of irrigation. The Indian Committee on Irrigation and Drainage (INCID) estimates a potential of 10.5 million ha.

Despite the apparent benefits and opportunities, the technology has not been fully explored by Indian farmers. High initial costs make the technology unfeasible for small and marginal farmers. Lack of technical support and follow up by the government, private companies and NGOs may be a hindrance for adoption. Only selected, pre-approved drip kits qualify for the subsidy which stifles creative marketing strategies on the part of manufacturers as well as efforts to bring down the cost of drip systems through innovative technology or product designs.

Micro irrigation is crucial for agriculture in years to come. With the water resources continually on the decline, call for sensible water management has strengthened in India. Horticulture – a high value avenue- could benefit immensely from the application of micro irrigation techniques.

Anjana

Anjana Nair

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The Bane of Basmati

EU revises norms regarding MRL of Tricyclazole spelling doom for basmati farmers

Basmati cultivation has been a lucrative venture for farmers considering the scope of the market – both domestic and international - and the premium price it fetches. But the basmati farmers are constantly pitted against the changing norms associated with exports. The recent challenge for them is the changed European Union norms regarding the spraying of the fungicide, Tricyclazole. The EU plans to bring down the MRL (Maximum Residue Limit) for tricyclazole to the default level of 0.01 ppm (parts per million).

Tricyclazole, developed by Dow Agri Sciences, is a cost effective fungicide used by farmers to prevent leaf and neck blast in Basmati paddy varieties. Rice Blast, caused by the fungus *Magnaporthe oryzae*, can affect all above ground parts of a rice plant: leaf, collar, node, neck, parts of panicle, and sometimes leaf sheath. Node and neck blast commonly occur together and have similar symptoms. When a node or neck blast infection is present, it can cause plants to develop few or no grains at all. Rice blast is one of the most destructive diseases of rice, since neck and node blast affect the panicle directly, inflicting high yield losses in affected plants. The most effective method of management recommended is the use of systemic fungicides like tricyclazole at heading, where the risk of yield losses is high. So Indian basmati farmers have been using Tricyclazole to prevent blast in Basmati varieties like PB1 and Pusa 1410, which forms the bulk of EU export.

Currently, the US and Japan allow Basmati imports with residues of tricyclazole up to 3 ppm and 10 ppm, respectively. Even Spain and Italy in Europe use Tricyclazole on their paddy crop. While the European Union (EU) has so far allowed a maximum residue limit (MRL) of 1 ppm (parts per million), after 31 December 2017, it has mandated that imports having an MRL above 0.01 ppm will not be allowed. The current levels of 1 ppm level does not pose a problem for Indian exports at the moment, as levels detected in Indian basmati consignments are much lower. However, if the MRL is brought down further to 0.01 ppm, as indicated by the EU, a large part of India's export of basmati to Europe could be affected.

India exports over 4 million tonnes of Basmati rice every year valued at over Rs. 22,000 crore. Exports to the EU currently are at 350,000 tonnes per year, valued at over Rs. 1,700 crore. India, the world's top rice exporter, shipped 3.5 lakh tonnes valuing Rs. 1,744 crore of basmati rice to the EU in 2016-17. The country's basmati rice exports to the EU comprise 10 per cent of the total basmati exports.

To effect the changes by December 2017, expedient changes have to be brought about in basmati cultivation. To restrict the levels of the fungicide to the 0.01 ppm level, spraying Tricyclazole has to be restricted just once before the 'boot leaf' stage, while the developing panicle is still to emerge from the stem. Booting happens about 70 days after transplantation (or 100 days from seeding in the nursery), which leaves another 45 days for flowering, grain-filling and final ripening. Tricyclazole residues remain in the plant for 30-35 days. So, if spraying is done at booting stage, the molecules will break down and there will hardly be any residues during maturity. However, this strategy may not work since blast can infect at a later stage as well.

Massive awareness campaigns are needed to materialize this in the following season. At least, two crop cycles are required to effect the desired change and given the ultimatum of December 2017, there is very little time for the farmers to cope with this change considering the crop is already in the field.

Dialogues are the only option available right now to tide over this predicament. The exporters are hopeful for a suitable solution and their hopes are pinned on the Indian delegation to EU. In the long run, attempts to breed resistant varieties and crop technologies to combat the problem of blast disease organically or mechanically can be developed, although its practical application at times of urgency is questionable. So fate of the Indian basmati farmers essentially lies in the oratory skills of the delegation and the compassion of the EU.

Budding Bonhomie

Modi's visit to Israel opens up a lot of opportunities from where agriculture can gain considerably

Narendra Modi's recent visit to Israel was celebrated as one of the historic moments as he became the first Indian Prime Minister to visit the country, 25 years after establishing diplomatic relations with Israel. The visit had much wider implications in the diplomatic realms and also in certain specific areas where agreements on cooperation has been inked. Indian agriculture, where Israel had exerted much influence, was one of the key areas of cooperation.

India signed several agreements with Israel on science, agriculture and technology, as part of Prime Minister Narendra Modi's visit. The agreements included the decision to create a bilateral technology innovation fund worth \$40 million for research in industrial development, and to establish a strategic partnership in water and agriculture to focus on water conservation, wastewater treatment and its reuse for agriculture and desalination, among other deals.

India, already water-stressed, with annual per capita availability of water at less than 1,500 cubic meters (cu m), is facing a grim future with competing water demands from different sectors. A well-established leader in water management, desalination and recycling techniques, Israel has set a template for reusing wastewater for irrigation. It treats 80 per cent of its domestic wastewater, which is recycled for agricultural use and constitutes nearly 50 per cent of the total water used for agriculture. Israel has per capita water availability of less than 200 cu m. It is an extremely water-scarce region, and yet exports high-value agri-produce to Europe and many other countries. So, if India has to learn about how to augment water supplies and how to use it more efficiently, there is no better guru than Israel.

Israel and India already have entered into several areas of cooperation in agriculture. Under the India Israel Agriculture Project, Centres of Excellence were established in various states which are helping the farming fraternity in India to adopt the latest technologies such as micro irrigation systems. An Indo-Israel agriculture action plan for 2015-18 is operational, and 15 of the proposed 26 centres of excellence in agriculture are being developed in India with Israel's help to showcase the latest technology to Indian farmers. Phase-I (2010-12) and phase-II (2012-15) of the agreement are complete. India has benefited from Israeli technologies in horticulture mechanisation, protected cultivation, orchard and canopy management, nursery management, micro-irrigation and post-harvest management, particularly in Haryana and Maharashtra.

Every year, more than 20,000 farmers visit the Agricultural Centre of Excellence at Gharaunda in Karnal, Haryana, where a nursery produces hybrid seedlings—including tomatoes, cherry-tomato, colored capsicum, cucumbers, eggplant and chilli pepper—grown in small, individual cells, ready to be transplanted into containers or a field. There was a five-to 10-fold increase in crop yields with an accompanying 65% reduction in use of water and noticeable decrease in the use of pesticides and fertilisers, according to December 2014 report on the Indo-Israel Agriculture Project. On June 28, 2017, the union cabinet approved a Memorandum of Understanding (MoU) with Israel on the National Campaign for Water Conservation in India. Technologically-adept Israel has developed water-management technologies, as it is located in a semi-arid region with limited sources of fresh drinking water.

Modi's visit to Israel can take the relationship between the two countries a notch higher. Notwithstanding the existing bonhomie between the two nations, the recent visit has brought them closer and leaves a wider scope for expansion in strategic areas like agriculture where Israel is a veteran when it comes to managing limited resources. India needs to keep allies like Israel closer considering their strengths in areas like water management. India with largest area under agriculture struggles with water management issues. In years to come, water constraints are going to get severe and we should try to get all the help from the land of innovation.

GST – Pro Agriculture

The GST regime has many positives for agriculture

July 1 – India saw another revolutionary reform as the country moved to the new Goods and Services Tax (GST) regime. Unifying the country under a uniform tax code is slated to bring massive changes for consumers and producers. Post the implementation of GST regime, it is a common belief that agriculture sector would benefit in the long run.

The new tax structure eliminates the multitude of taxes, the rates of which changes considerably between states. Taxes under different headings -value added tax, infrastructure tax, rural development tax among many others would be abolished to make way for GST. This ensures a level playing field for farmers across the nation boding well for the successful implementation of National Agriculture Market. e-NAM (National Agricultural Market), a pan-India electronic trading portal launched by Ministry of Agriculture & Farmers' Welfare, Govt of India is intended to facilitate farmers, traders, buyers, exporters and processors with a common platform for trading commodities. The fragmentation of markets according to the existing marketing structure, hinders free flow of agri commodities from one market area to another and multiple handling of agri-produce and multiple levels of mandi charges ends up escalating the prices for the consumers without commensurate benefit for the farmers. NAM was designed to address these challenges by creating a unified market through online trading platform. The pre GST differential tax structure, however, was a major hindrance to the success of this idea. Thus GST becomes pertinent for the successful implementation of NAM. Most of the indirect taxes levied on agricultural products, would be subsumed under GST. This will create a transparent, hassle free supply chain which would lead to free movement of agri-commodities across India.

GST rates for fertilizers were also brought down as the GST council reduced GST rate on fertilisers to 5 percent from 12 percent and on exclusive parts of tractors to 18 percent from 28 percent. Under the new rates, the average weighted maximum retail price (MRP) will decrease to Rs. 5909 a tonne (or Rs. 295.47 per 50kg bag) as compared to the existing all-India weighted average of Rs 5923 a tonne (or Rs. 296.18 per 50 kg bag). After GST, there will be a uniform MRP of Rs.295.47 per 50 kg bag across the country except couple of states where additional value added tax (VAT) is charged on natural gas. Similarly, MRP of P&K Fertilisers, for which the prices are not administered, are also expected to come down on an average basis as the incidence of tax will be lower than the existing tax on an average. The GST regime, apart from integrating the entire fertilizer market into a single market, will also deter inter-state smuggling of fertilizers due to differing levels of taxes and consequently MRPs in different adjoining States.

However, bio-fertilisers, bio-pesticides and organic manures has been kept under the 18 per cent slab. A higher GST on bio-fertilisers and organic manures will promote the use of chemical fertilisers curtailing the prospects of organic farming. To promote organic farming and less chemical intensive agriculture, GST on biofertilisers, biopesticides/biological control agents (BCA) and branded organic manure/vermicompost/ farmyard manure (FYM) need to be reduced especially since these are suitable alternatives to improve soil health which has considerably degraded due to the over use of chemical fertilizers and erosion of organic matter content in the soil.

GST would also bring a sigh of relief to those farmers or traders who move their goods between states who most of the time find themselves stuck in endless queues to get across state borders. The waiting not only affects the quality of the produce but also discourage farmers from carrying out business. The GST aims to remove the hidden, cumulative costs of doing business in India and has the additional benefit of reducing food wastage.

GST as such has been generous towards the agriculture segment. The implementation will positively influence the state of farmers as their share in profit and ease of doing business across the nation is expected to improve.

Securing Farmers Financially

Doubling farmers' income is crucial to Indian agriculture

After the biggest economic reform that the nation has witnessed since independence, now it is the turn of the nation's farmers to brace for another major revolution in agriculture. This time the targets are not production numbers but income prospects. At different occasions, the central government has reiterated its stand in this regard and is vehemently looking at strategies to achieve the same by the time the country celebrate its 75th independence day in 2022. The Centre has asked states to chalk out relevant plans to achieve the goal of doubling farmers' income by 2022.

The recent farmer protests across the country has been a reflection of the state of affairs existing in the real agriculture world. The simmering tension which led to outbursts and violent incidents is suggestive of the widespread discontent among farmers. The solution for which lies in improving the farmers' welfare and doubling farmers' income. The average monthly income per agricultural household from various sources is estimated to be Rs 6,426, according to the survey done by the National Sample Survey Office in 2013. Nearly 52% of agricultural households in India are indebted and nearly 40% of all loans came from informal sources with 26% advanced by moneylenders. Factoring in the debt factor and the declining income prospects of individual farmers, a roadmap has been outlined by the Niti Aayog for farm sector reforms and doubling farmers' income by 2022.

The roadmap presents quantitative framework and identifies seven areas for growth - increasing crop yields, livestock production, efficient use of agri- inputs, improving crop intensity, crop diversification, improved price realisation to farmers and shifting cultivators to non-farm jobs. Agriculture being a 'state subject', the policy paper was shared with the states for devising a relevant strategy so as to realise the goal of doubling farmers' income by 2022. The ministry has also constituted an inter-ministerial committee for recommending a suitable strategy.

The decision to change the focus from being production centric to farmers' welfare centric shows the change in the thought process of the agriculture development strategy. However the steps to increase the income revolves around increasing the productivity and production of the farm lands. The main stress therefore will be on increasing the area under irrigation, diversification of crops to help farmers sow more than one crop in rain fed areas and linking the farmers to a common market through E-Nam for ensuring remunerative returns. The strategy would also focus on developmental, technological and policy initiatives to double farmers' income and provide irrigation to the rain fed area, which would be a major component. Irrigation however would emerge as a crucial element in the strategy. At present, the total area in the country under irrigation is 45 percent and the production in irrigated area is double as compared to the rain fed area.

In 55 percent cultivable land, only one crop is sown while 45 percent area is without crops for eight months in a year. This provides ample scope for crop diversification which not only increases the land productivity but also double the farmers' income. Although production is a concern, marketing of agricultural produce is another area which has been causing some amount of discomfort to the farmers. E-Nam, the electronic trading platform for the whole of the country is another alternative that can help farmers market their produce without the intervention of middle men and cut in their profit share. The schemes to promote soil health card, neem-coated urea, crop insurance and interest subvention are also aimed at increasing farmers income.

Farmers' welfare is the key to India's agriculture future. The strength of Indian agriculture lies in its numbers rather than productivity. Our agriculture derives its supremacy from the innumerable small scale and marginal farmers scattered across the country. Their well being is therefore crucial to Indian agriculture which can only be guaranteed by an elevated income status and financial security.

Birlas ready to sell fertilizer arm

► The stage is set for the sale of the fertiliser business of Aditya Birla group company Grasim, which has merged Aditya Birla Nuvo's operations with itself. Bankers said two companies had shown interest in buying the business, which was likely to fetch Grasim close to Rs 3,000 crore. The fertiliser industry depends on government subsidies that are released a couple of quarters late, affecting margins. A Birla group source said the sale was line with the group's policy of consolidation and focus on core businesses. The fertiliser business, then housed with Aditya Birla Nuvo, earned Rs 2,498 crore in 2015-16 and its earnings before interest, tax, depreciation and amortisation were Rs 178 crore. In 2016-17, sales were Rs 2,164 crore and EBITDA Rs 153 crore. The consolidation of businesses has enthused investors with Grasim's

market value going up by Rs 28,000 crore, or 49%, since January against a 20.3% rise in the Sensex. Trading in Aditya Birla Nuvo shares has been suspended pending the merger. The stock has climbed 47% since January.



Apart from the fertiliser business sale, Grasim is also ready to list its financial services business by mid-August. The business has received a Rs 700 crore investment from Premji Invest, according to a valuation of Rs 32,000 crore. The new Grasim will have EBITDA of Rs 12,259 crore and a net

profit after tax and minority interest of Rs 4,076 crore as of March. Its businesses will include cement, VSF and caustic soda, and it will have a holding stake in the merged Idea-Vodafone. Tata Chemicals had last August sold its urea plant in Babrala, Uttar Pradesh, to Norway's Yara International for Rs 2,670 crore. Tata Chemicals has retained its Haldia plant and brands. According to an analysis by SBI, the fertiliser industry is facing threats from cheap imports from China, Iran and Oman. Indian companies are reducing their investments because the government pays the fertiliser subsidy to them 6-12 months after the sale. Fertiliser manufacturers have large working capital requirements that add to their costs along with a longer cash conversion cycle.

A bad deal, say fertiliser makers

► The decision to lower the Goods and Services Tax (GST) rate on fertilisers from 12 to 5 per cent — taken at the last minute just before the new taxation regime kicked in on July 1 — hasn't gone down too well with the industry. Manufacturers of diammonium phosphate (DAP) and complex fertilisers say the duty cut on final product without a simultaneous reduction in rates on inputs — phosphoric acid and ammonia — will render domestic production unviable and result in a flood of imports. Phosphoric acid and ammonia — which are the sources of phosphorus (P) and nitrogen (N), respectively, for manufacture of DAP and NP/NPK complexes — attract 18 per cent duty under the GST rate schedule. About 465 kg of phosphoric acid and 223 kg of ammonia are required for producing one tonne of DAP. At current landed prices of \$ 567 per tonne for phosphoric acid and \$ 250 per tonne for ammonia at Indian ports, the cost of these imported inputs — after adding 5.15 per cent customs duty and the 18 per cent integrated GST on top — works out to \$ 396 or Rs 25,560 for every tonne of DAP. Adding processing and all other costs (bagging, financial charges, marketing expenses, dealer margins, etc.) of Rs 5,000 takes the total to Rs 30,560 per tonne. After netting out the Centre's subsidy of Rs 8,937, a domestic manufacturer would be able to sell DAP at Rs 21,623 per tonne or so. On the other hand, DAP is directly importable at \$ 355 per tonne, while attracting only 5 per cent customs duty and the same IGST on top of it. Adding these and costs of stevedoring, bagging, distribution and financial charges, etc. of Rs 3,000, the total comes to Rs 28,244. Minus the subsidy of Rs 8,937, the imported DAP can sell at Rs 19,307 per tonne. Simply put, a 50-kg DAP bag would roughly Rs 115 cheaper if imported, as opposed to being manufactured at home. The economics is somewhat better for phosphoric acid produced domestically for captive consumption. In that case, the 18 per cent IGST will not get charged, even though imported merchant ammonia would continue to attract this rate. The Indian Farmers Fertiliser Cooperative, Coromandel International Ltd (CIL), Paradeep Phosphates, Gujarat State Fertilisers & Chemicals and a few others have their own phosphoric acid manufacturing facilities. These, in turn, use imported rock phosphate and sulphur as raw material. But even for them, the IGST rate on rock phosphate has been set at 5 per cent, while 18 per cent for sulphur recovered as by-product in refining of crude oil!



Ipsta exits from futures, may set up spot trading hub

After conducting futures trading in pepper for about six decades, the India Pepper and Spice Trade Association (IPSTA) pulled down its shutters for futures. The Board of Directors of the Association took the decision following zero trading on the exchange platform for the past one year, which, as per SEBI norms, disqualified the exchange from further trading. It therefore opted to exit, Kishor Shamji, one of the directors, informed. Given the IPSTA's association with pepper for about 60 years and so as to remain in the trade, Mr Kishor, a veteran exporter and former President of IPSTA, said the board of directors, has "prima facie" decided to convert IPSTA as a spot trading hub for pepper.

Branded rice suppliers protest zero-GST for India Gate

The fact that the country's largest selling rice brand, India Gate, is exempt from the 5% goods and services tax (GST) since the popular brand is not registered under the Trade Marks Act 1999 has driven a wedge between KRBL, which owns India Gate, and other major branded rice traders. All India Rice Exporters Association (AIREA), in which most branded rice firms are members, has written a letter to finance minister Arun Jaitley, asking him to correct the anomaly in the relevant notification dated June 28, by stating essentially that a "registered brand name" in this context need not be one registered under the Trade Marks Act. It is, however, unclear whether the Centre would accept the request as even in a clarification issued on July 7 on the said notification, the finance ministry maintained that "...In this regard, Section 2 (w) read with Section 2 (t) of the Trade Marks Act, 1999 provide that a registered trade mark means a trade mark which is actually on the Register of Trade Marks and remaining in force. Thus, unless the brand name or trade name is actually on the Register of Trade Marks and is in force under the Trade Marks Act, 1999, CGST rate of (2.5%) will not be applicable on the supply of such goods." "There is a growing feeling among the members, with a fully registered brand name, of being at a comparative disadvantage specifically against companies with a popular brand name, but not registered or a company who's registration for trademark application is still in process," Vijay Setia, president, AIREA, wrote in the letter to Jaitley.

Jain Farms to take ultra-high-density mango planting to TN, Karnataka

Jain Farm Fresh Foods Ltd (JFFFL), a wholly owned subsidiary of Jain Irrigation Systems, is on a capacity building drive to make mango farming sweeter for over 3 lakh farmers in Southern India by 2027. JFFFL began the exercise by inviting around 600 mango farmers from across the state to its facility at Elayamuthur near Udumalpet recently. Taking them around the farm, JFFFL sources explained the salient features of the Ultra High Density Plantation method in mango and tissue culture for banana and pomegranate. They demonstrated drip and sprinkler irrigation systems and also showed the farmers the mango nursery, particularly the UHDP mango farm, which is said to be the oldest in India. Sunil Deshpande, Managing Director, JFFFL, said the company is focused on improving farmers' economic empowerment through adoption of Good Agricultural Practice (GAP) and extension of Project Unnati. "Project Unnati is a sustainable agriculture initiative, introduced initially in Andhra Pradesh in 2011. Over 22,000 farmers have been successfully trained in AP in the pilot phase of this project. We are now extending it to the farmers in Tamil Nadu and Karnataka. This programme is in association with FMCG major Hindustan Coca-Cola Beverages," Deshpande said.



Comex union: NMCE, ICEX to merge for survival

The National Multi Commodity Exchange has decided to merge with the Reliance Group-promoted Indian Commodity Exchange, which had suspended trading in 2014. The merger has been approved by the Boards of both exchanges and is expected to be completed by end of this year. The merger will make the combined entity the third largest commodity exchange, after MCX and NCDEX. ICEX shareholders will hold a 62.8 per cent stake while NMCE investors will own the rest in ICEX, post merger. Anil Ambani's Reliance Group has an equity interest in both the exchanges. The new exchange will offer a range of contracts, including bullion, oil, rubber and other agri commodities. It will also offer the world's first diamond futures contract, which has received 'in-principle' regulatory approval. In April, ICEX raised Rs 50 crore through its maiden rights issue, valuing the exchange at Rs 250 crore. Apart from ICEX, Ace Commodity Exchange, promoted by Kotak Mahindra and United Commodity Exchange, owned IT firm Commex Tech, also suspended trading a few months after going live. Anil Mishra, MD, NMCE said: "The large base of warehousing facilities of CWC, with a storage capacity of 9.89 million tonnes, will be available to the combined entity pan-India." Sanjit Prasad, MD, ICEX said: "The merger will result in greater financial strength, consolidation of clients and members, enhanced product basket and higher operational synergies..."

Agriculture ministry finds it hard to dispose of pulses' stock

➤ The disposal of pulses, which were procured from foreign destinations as well as domestic procurement, to bring down the skyrocketing prices, is proving to be a major challenge for the official of Ministry of Consumer Affairs. After failing to find a 'suitable' buyer for the year-old pulses' stock, the concerned ministry has brought the issue into notice of Committee of Secretaries (CoS) to find out a solution to dispose of the price sensitive lentils. According to sources, the issue to 'sell' pulses would be discussed in the meeting of CoS. "Now, it's in the court of CoS to decide procedures for disposal of procured pulses, which are in buffer stock for over a year. The decision would obviously lessen the burden of the department," the source said, adding that the panel would first recommend the ways to dispose of pulses kept in the stock for over 10 months. Notably, the Centre, which had faced the ire of billions of consumers in 2015 over the unprecedented rise in prices of lentils, is struggling to find buyers for more than 10 lakh tonne of pulses procured through imports at the rate of Rs 104 per kg. The situation erupted after prices of pulses crashed in the domestic market in 2016 due to bumper production, states didn't turn up to buy imported pulses even at the rate of Rs 66 per kg, which is almost half of the procured price.



Fumigation of pulses from US, Canada, France at ports allowed



➤ The government has exempted pulses imported from Canada, France, and the US from mandatory fumigation at the port of origin, a senior government official said. These countries have been allowed to fumigate pulses cargoes at Indian ports by paying only the fumigation fee, the official said. "The relaxations have been granted to these countries in view of India's bilateral relations with them," the official said. The exemption paves the way for continued pulses imports from these countries. For all other commodities, imported from other countries, importers have to pay a high penalty in case fumigation is not done at the port of origin. The penalty is five times the inspection fee for the first default, seven times the inspection fee on second default and 10 times the fee on the third instance of default, or not meeting any conditions laid down under the plant quarantine norms.

Centre hikes sugar import duty to 50%

➤ Bowing to pressure from the domestic sugar industry, the Centre on Monday hiked the import duty on sugar from 40 per cent to 50 per cent, to check cheap imports. The Finance Ministry issued a fresh notification raising the import duty from the 40 per cent rate announced on June 30 to 50 per cent. "We are very happy at the Government's decision as the domestic sugar industry will benefit," said Abinash Verma, Director General of the Indian Sugar Mills Association. "With global prices moving up slightly and import duty at 50 per cent, we do not expect much import to take place." Cheaper imports have been adversely affecting sugar mills. Verma said retail prices have stabilised in the last six months. But, with the Centre increasing the fair and remunerative price of sugarcane by about 11 per cent to Rs 255 a quintal for the season beginning October, sugar mills have been finding it difficult. To be viable, the ex-mill gate price of sugar should be Rs 36-37 per kg, he said, adding that this would help stabilise the retail price at Rs 43 per kg.



Direct benefit transfer for fertilizer may begin in Aug

➤ With pilot projects indicating success, direct benefit transfer (DBT) of fertilizer subsidy will be introduced across the country from next month, a government official aware of the plan said. Point of sale (PoS) machines which will capture details of the farmer, the retailer and the transaction have been deployed in most of the states, the official said, asking not to be identified. States like Gujarat, Rajasthan, Delhi and Goa



have nearly completed the exercise. "Fertilizer retailers in all states will complete deployment of PoS machines. We are doing dry runs in many places. The scheme will be rolled out in August," the official said. Any

savings in subsidy outgo — Rs70,000 crore estimated for fertilizers alone in 2017-18—will help finance minister Arun Jaitley balance budget in a year capital expenditure is projected to increase 11% to over Rs3 trillion.

Govt removes stocking limit on pulses to check malpractices

➤ The Delhi Government has issued a notification to remove the stocking limit on pulses in order to keep their prices under control. This has been done following a request made by various grain merchant associations. The associations had been contending that such practices were leading to artificial spiralling of prices of pulses in the market in an uncompetitive way, a statement issued by the government said. In the past, the stock limits were a necessity due to the limited supply of pulses and to check undesirable and unhealthy practices of hoarding and blackmarketing. The Central Government has also been intervening from time to time in order to prevent such unwarranted activities. The Centre had also recently asked various state governments, including Delhi Government, to consider removal of stock limits on pulses. The Food and Supplies Minister, Imran Hussain, said after detailed deliberations with various stakeholders, including various grain merchant associations and Department of Food and Civil Supplies and Consumer Affairs, it was decided to do away with the imposition of stock limits for pulses in the city.

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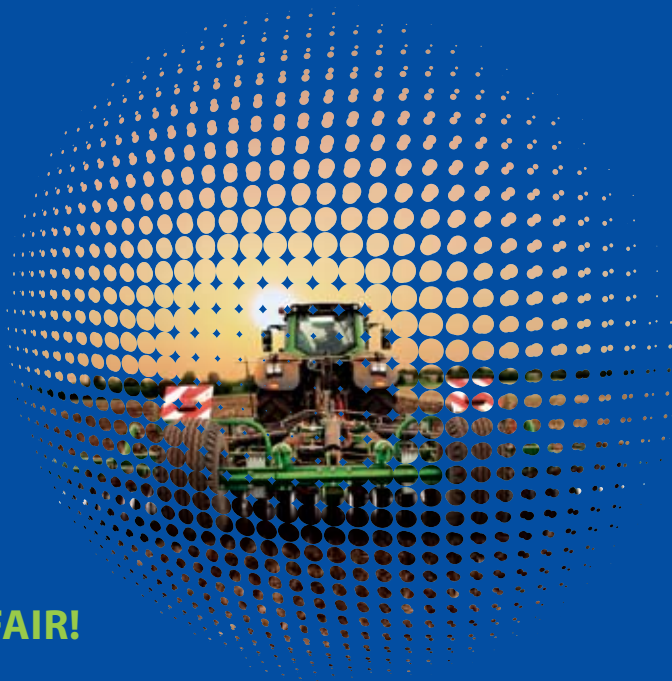
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Challenging times for Punjab agriculture'

➤ The mandi prices of maize in Punjab have fallen well below the Minimum Support Prices (MSP) recently mainly because of bumper production in the current crop year and heavy pre-monsoon showers, prompting the farmers to demand 'price deficiency payment' system recently mooted by NitiAayog. The mandi maize prices are presently ruling around Rs.1,000 to Rs.1,100 per quintal depending on the moisture content in the state while the Centre has declared MSP of `1,365 per quintal for the current crop year (2016-17). However without any procurement by state or central agencies, farmers have been resorting to distress selling. Recently, the Aayog had suggested a new system where differences between MSP and market prices is paid to farmers in case mandi prices fall below MSP. The Aayog had also noted that excessive focus on cultivation of crops like wheat, rice and sugarcane in the key procuring states, including Punjab, because of MSP operations, has led to distortion of cropping patterns. Despite the crash in price, maize is being promoted for encouraging crop diversification from common rice in the kharif season which would cater to poultry feed, silage and starch industries. Besides farmers grow maize in rabi season as well. Maize is mostly sown in Punjab around March or April after rabi wheat or potato is harvested.

15 mandis in Tamil Nadu to move on to eNAM platform this year

➤ Prime Minister Narendra Modi's flagship scheme — eNAM (electronic national Agriculture Market) — is set to be introduced in 15 markets in Tamil Nadu this year, according to sources from the State's Agriculture Marketing Department. This includes Villupuram, Ulundurpet, Ambur, Udumalaipettai, Dindigal and Cumbum. Currently, only two of the 270-plus regulated markets in the State are seeing electronic trading. One electronic market is in Vellore, where the State Government is using its own software, and the other is in Perundurai where the mandi is using the Unified Market platform of Rashtriya e Market Services. A pilot run was conducted in these markets over the last 4-5 months. While electronic bidding is taking place, there is no sorting or quality testing equipment in either market. The Centre will be giving Rs 75 lakh as cash assistance to each eNAMmandi to set up grading and assaying facilities and other infrastructure, says a key official with the Department. While funds have not reached the State yet, they will soon be transmitted and shortlisting of service providers for the infrastructure has already begun, he adds. It is estimated that each market under eNAM will require about Rs 1-1.5 crore to be set up with all basic infrastructure facilities, including grading and sorting equipment. To provide grading and assaying services, the Department is looking at looping in AGMARK laboratories. The eNAM portal was launched in April 2016. Since then about 417 mandis in 13 States have been integrated with it, with Tamil Nadu being the latest. The challenge is in making traders, who have all along been transacting physically and dealing in cash, to move online.



UP sets aside Rs 36,000 cr for farm loan waiver in budget

➤ The Yogi Adityanath government in Uttar Pradesh presented a Rs 3,84,660-crore budget for 2017-18 — up 10.9% from the previous year — in the state assembly with a special provision of Rs 36,000 crore to enable waiver of crop loans of small and marginal farmers. Madhya Pradesh, Punjab, Tamil Nadu and Karnataka had earlier announced farm loan waivers; fiscal impact of the largesse, analysts said, would be felt over many years. "We expect the waivers to be spread over several years, and less than 0.2% of GDP in FY18," Credit Suisse said in a recent report. State's finance minister Rajesh Agarwal said the government's target is to achieve an annual GSDP growth rate of 10% over the next five years. Towards this end, he said, the government was focusing on rural development along with the overall development of the state. Reiterating that the state government's commitment was towards farmers and marginalised sections of society, the minister also cited other key initiatives that are high on the priority list for the government, such as the single-window clearance system for projects, power-for-all and Make-in-UP. The budget provided Rs 55,782 for new schemes, Rs 3,255 crore for construction of toilets, Rs 2,800 cr for drinking water in Bundelkhand and Purvanchal and Rs 1,000 cr for the Swachha Bharat Mission in UP cities.



A new initiative to promote organic farming in NE

➤ Meghalaya-based Zizira, which is engaged in the area of natural food products, is looking to open markets in a way that will benefit the farmers of north-eastern region. “Agencies and the Government institutions help farmers with schemes, research and improved technological models, but they do not typically open markets. The farmers simply want to sell and make money. This is where Zizira comes in. Zizira is striving towards a successful business to sell products to the metro cities across India,” Ibansara Shullai, Coordinator of Zizira, informed. She added, “Farmers sell the crops in the local markets or to middlemen at lower prices. We are working towards changing this

concept.” “Currently, we source from over 100 farmers around Meghalaya out of which we work closely with 30-40 farmers,” Shullai said. Zizira is using the online platforms such as Amazon and eBay as well as its own website to reach out to the customers for locally-sourced products. “We have also created an online community to source agricultural products or share knowledge. Ushahidi is a powerful mapping tool where people can get critical and timely information. The tool is very easy to use. Anyone can access it from anywhere and post information world-wide. It is also used for providing assistance to anyone who wants to gather vital information on any topic. We hope to help people source

agricultural products or share knowledge,” she said. Shullai added, “Our focus is on the farmers of this region. Moreover, our intention is to promote locally-grown produce like the famous Bhut Jolokia.” Asked about Zizira’s efforts to promote organic farming in Meghalaya, she said, “Most of the farmers in the North-east use traditionally organic mode of farming. Zizira is helping the farmers by opening markets through robust e-commerce facilitation. We are mostly promoting responsible farming. And, we are trying to release the under-utilized potential of family farmers. Because of the uniqueness of the region, farmers should be able to grow a variety of crops that can sell for a higher amount.”

Karnataka woos traders from other States to its online agri platform

➤ After connecting a majority of the agriculture markets across the State, Karnataka is now reaching out to traders and large buyers from other States to join its electronic commodity trading platform. Karnataka, an early mover in implementing agriculture market reforms, since 2013, has already connected about 157 of the 162 agriculture markets across 29 districts in the state through the Unified Markets Platform (UMP), where bidding takes place online. Rashtriya e-Market Services (ReMS), the joint venture between the Karnataka Government and NCDEX Spot Exchange Ltd, which rolled out the UMP, has launched a multi-lingual campaign to attract traders from other States aggressively. A trader or buyer from any State can buy a single trading licence for a fee of Rs 200 and can purchase commodities from any of the 157 markets in the State either in person or through the online mode. About 298 lakh tonnes of commodities, valued at Rs 56,696 crore, have been traded through the UMP platform. Besides a multi-lingual audio-visual campaign in television channels, REIMS has also taken to the social media route through YouTube to reach out to traders in other States. “We also plan to conduct roadshows in major consuming centres of commodities such as dry chilli, copra, arecanut, tur, tamarind and turmeric, among others, to attract the traders from those States,” said Manoj Rajan, MD and CEO of ReMS. About 32,000 traders are already enrolled on the ReMS platform through the unified trader licence, including several from States such as Tamil Nadu, Andhra Pradesh, Maharashtra, Kerala, Haryana, West Bengal and Delhi.

GST impact: arecanut, copra markets in Karnataka may be streamlined

➤ The GST regime is expected to help streamline markets for commodities such as arecanut and copra, bringing more buyers and sellers into the organised market, while reducing off-market transactions. Both arecanut and copra — the ball variety produced in Karnataka — attract 5 per cent GST as against 2 per cent VAT earlier, making them a bit expensive in the new regime. They also continue to attract a market fee of 1.5 per cent and commission of 2 per cent in Karnataka, where they are largely grown. Trade sources feel that the uniform tax and the fear of increased vigilance and penal provisions may bring in more buyers, mainly from the northern states, into the regulated markets. To avoid taxes in the earlier regime, a section of buyers used to stay away from the organised markets and source their requirement from growers and agents through off-market transactions. Unconfirmed estimates suggest that the off-market transactions in these two commodities are estimated to be as high as 40-50 per cent.



Maharashtra: Banks meet only 27% of kharif credit target in Q1

➤ Institutional lenders have met only 27% of their total crop credit target in Maharashtra for the current kharif season, data released by the Pune-based State Level Bankers' Committee (SLBC) says. Of the total crop credit target of Rs40,547 crore set for the kharif season in Maharashtra, banks have disbursed just Rs11,034 crore to more than 1.6 million farmers in the quarter ended 30 June. According to Ahilaji Thorat, SLBC member secretary and deputy general manager of Bank of Maharashtra, this amount is around half what was disbursed in the year-ago period. "Till the corresponding date last year, banks had extended around 55% of their kharif target. The disbursement has been low though the banks have been given funds as per their targets," Thorat said. The lenders include public and private sector banks, district co-operative banks and regional rural banks—those whose loans to farmers have been waived with certain riders by the Maharashtra government. Low recovery of the previous season's debt, the government's farm loan waiver and lack of clarity over the eligibility criteria are all being cited by bankers to explain the low levels of credit disbursement.

Centre allows states to have their own insurance agencies

➤ The Centre has allowed states to establish their own insurance agencies to enrol farmers under Pradhan Mantri Fasal Bima Yojna. The decision in this regard was taken by the government after states raised their concern over the hefty amount being paid to insurance companies even if there is no crop loss. The demand was raised by states during a review meeting of all agriculture ministers over the implementation of National Agriculture Market (NAM) and Soil Health Card. The states raised the point that they are being 'compelled' to pay a huge amount as crop insurance premium to private companies registered under the Pradhan Mantri Fasal Bima Yojna. "In case there is no loss of crop, the states wouldn't be 'forced' to pay the premium amount if they have their own insurance companies. So it would help in saving the public money, which could be utilised for other welfare schemes," an official said, who was present at the meeting. The states, during the review meeting, stressed that they have been paying the insurance premium to private companies in crores for the last two years even when there is no crop loss. The hefty amount is turning out to be net profit for the ten registered firms, the states told the Centre. Under the new crop insurance scheme, the private insurance companies have been paid Rs 17,184 as the premium amount in the year 2016 and out of that only Rs 6,804 crore was paid as the claim to farmers while remaining Rs 10,000 crore went into the coffers of insurance

companies. According to the official, when Union Agriculture Minister Radha Mohan Singh 'accepted' the state's demand, Rajasthan and Punjab announced setting up their own insurance agency during the review meeting. The new crop insurance scheme was launched in April 2016 to enable farmers tide over chronic crop losses due to various calamities.



Don't force farmers to repay loans: SC to govt

➤ Farmers reeling from drought should not be coerced for recovery of loans and government should interfere if a financial institution is found to be doing so, the Supreme Court said. "The government's approach should be preventive rather than compensatory and it should travel the last mile to reach out to the farmers," a bench headed by Justice Dipak Misra told the Tamil Nadu government while hearing a PIL filed by state farmers. The court's remarks comes after a bench headed by Chief Justice JS Khehar gave time to the Centre to implement its new schemes for farmers. The bench was informed that farmers were forced to commit suicide because banks that lend money to them take coercive action for recovery. The court asked the state to devise a mechanism where farmers can go to the government seeking help, if an action was taken against them for loan default due to crop failure. Administrative action should also be taken to get rid of middlemen who purchase produce from farmers at throwaway prices.

No clarity, farmers stop paying loans

➤ Farmers are confused about the type of loans which have been announced as waived by the Punjab government. In such a scenario, banks are finding it difficult to recover other loans from them. After Chief Minister Capt Amarinder Singh's statement about waiving crop loans of Rs 2 lakh, farmers have stopped paying instalments of their loans. A number of farmers are daily approaching the banks to get clarification on the loan waiver. Some banks have now displayed notices outside their branches asking farmers to pay their loan instalments to avoid extra interest or penalty. A notice displayed outside the Punjab Agricultural Development Bank (PADB), Muktsar branch, farmers are informed that theirs were term loans and not crop loans, so they should pay their instalments by July 15 to avoid extra interest on it.

Farm loan recoveries drop, banks stop fresh lending in Punjab

❶ Banks in Punjab have stopped fresh lending to farmers who are defaulting on repayments in anticipation of a debt waiver with loan recoveries plummeting by about 60 per cent in the state, bankers said. After the Punjab government announced a debt waiver for the farming sector, growers in several parts of the state have stopped repayment of bank loans in anticipation of relief. “We have witnessed about 60 per cent drop in repayment of farm loans as accounts are turning irregular,” Punjab State Level Bankers Committee (SLBC) Convenor and Punjab National Bank General Manager (Punjab) P S Chauhan said. “It is happening as farmers are waiting for debt waiver implementation,” he said. “In accounts which have become irregular, we are not making any enhancement in such loan accounts. For example, if a defaulting farmer wants enhancement of Rs 1 lakh in his loan account, we are not allowing this,” he said. To speed up recoveries, banks are warning growers that they would not get interest subvention in crop loan if they fail to repay loans. “There will be no interest subvention of 3 per cent available to farmers if he does not repay loan. Moreover he will also not be eligible for fresh lending,” he said. Not only in commercial banks, the recovery of loans has been hit in case of cooperative banks as well, the official said. A loan of Rs 3,600 crore was yet to be recovered from farmers who borrowed from cooperative banks. As part of the debt-waiver plan, the Punjab government had last month announced the full waiver of crop loans up to Rs 2 lakh for small and marginal farmers (up to 5 acres), and a flat Rs 2 lakh relief for all other marginal farmers.



Crop insurers made Rs 10k-crore profit amid agrarian crisis: CSE

❶ An independent evaluation of the Modi government's much-touted crop insurance scheme has showed that insurers gained nearly Rs 10,000 crore in gross profit during the last kharif season, from June to November 2016. However, it settled less than a third of the crop-loss claims filed till early this year. The report released by the Centre for Science and Environment (CSE) showed state-level “implementation gaps” in the Pradhan Mantri Fasal Bima Yojana (PMFBY), which replaced the previous National Agricultural Insurance Scheme in April 2016. These discrepancies could negate the benefits accorded by the scheme to farmers, the non-profit think tank said. The CSE report cited state-wise data from the ministry of agriculture and farmers welfare to show that insurance companies had only settled 32.45% of the claims made till April 2017. While farmers raised claims for nearly Rs 6,000 crore, they were paid less than Rs 2,000 crore. Citing data from the Insurance Regulatory and Development Authority of India, the CSE pointed out that insurance companies grossed more than Rs 15,891 crore in premiums. The claims amounted to a little over Rs 5,962 crore. Of this, less than a third was paid out. “Data released

by the IRDAI indicates that the PMFBY played a significant role in the non-life insurance industry in financial year 2016-17,” the report added. However, insurance companies contended that the gap between the premium collected and the claims processed will go down as the scheme covers more farmers. “Kharif 2016 was a good period for agriculture. There was undoubtedly a surplus this time, but it's like a reserve for the future. Claim settlements are still on,” said Ajay Singhal, deputy general manager (crop insurance) at the Agriculture Insurance Company of India. The premium for crop insurance under the government scheme is heavily subsidised, with the Centre and state governments pitching in to share subsidy costs. However, the think tank's findings suggested that state governments – in several instances – wanted to keep their outflows low. While the state government's share of the premium for the 2016 kharif season was Rs 650 crore in Bihar, about a quarter of its annual agricultural budget, Madhya Pradesh paid nearly Rs 1,500 crore, which is 60% of its annual budget. “The economics of poor states does not allow for a 50-50 sharing formula with the Centre. The government should

come up with a graded subsidy-sharing arrangement,”? said Chandra Bhushan of the CSE. Though the report described the PMFBY as “a classic case of poor implementation of a good scheme”, it also mentioned a few positives that arose through the central initiative. Foremost among them was the fact that farmer coverage had crossed four crore, a gain of nearly 25% over the previous year. The PMFBY narrows the gap between the actual cost of production and the sum insured, a major impediment faced by farmers in previous versions of the insurance scheme. Incidentally, the implementation-related shortcomings listed in this report are strikingly similar to the discrepancies found by the Comptroller and Auditor General (CAG) of India in crop insurance schemes that were in effect between 2011 and 2016. The CAG report was tabled in Parliament on Friday. The CAG findings say even though the Centre released its share on time, delay on the part of the states “defeated the objective of providing timely financial assistance to the farming community”. It stated that while coverage of farmers under the schemes was “negligible”, two-thirds of the subjects surveyed were not even aware of them.

New EU norms likely to hit rice exports from India

► The new criteria for the maximum residue limit (MRL) for tricyclazole, a chemical used in India to treat rice, to the level of 0.01 ppm (parts per million) from 1ppm by European Union (EU) has left rice exporters in the lurch. The EU has also fixed a deadline to bring down the MRL of tricyclazole to 0.01 ppm by January 1, 2018 while the paddy crop, which would be

exported in 2018 after processing, is being cultivated in the fields and the rice exporters have very less time. Rice exporters are worried that that this criteria may hit the rice exports of around 3.5 lakh tonne to the EU. The exporters have approached the Union government to make efforts for providing Indian industry more time from the EU. Besides, they

are approaching the farmers for the perfect use of pesticides. As many as 24 workshops would be organised in various parts of basmati-growing areas like Haryana, UP and Punjab to educate farmers. "Tricyclazole is a good chemical to save the plant from leaf and neck blast, but the haphazard use of this chemical by farmers may hit the export of around 3.5 lakh tonne of rice varieties — PUSA basmati-1 and PUSA basmati-1401 to EU," said Vijay Setia, president, All India Rice Exporters' Association. "Earlier, the MRL for tricyclazole was fixed at 1ppm in EU, while it is still 3ppm in the US. It is very tough to meet the new EU norms and it can pose hardships for the exporters and farmers," he said. "We have already conducted more than 10 workshops and the rest would be conducted by the end of this month so that we can educate farmers about the proper use of pesticides," he said.



Kerala seeks MEA help to buy African cashew nuts

► For deepening the trade partnership between India and Africa, the Kerala government and top diplomats from African countries met last week to ensure level-playing field for raw cashew cultivation and cashew nut processing industry on both sides. At a recently concluded two-day Cashew Nut conclave organised by the MEA, Kerala has requested the Economic Diplomacy Division of the MEA to direct Indian missions to liaise with the concerned ministers and organisations to facilitate direct procurement of cashew nuts from the African countries. According to MEA, "The state government has requested the MEA to help evolve a plan of action to enter into a letter of intent (LoI), or MoU, with the African nations to source raw cashew nuts, negotiate prices and to ensure more work days to around three-lakh labourers in cashew factories in Kerala so as to have a win-win agreement." Kerala chief minister Pinarayi Vijayan, while addressing the top diplomats from the African countries, had stressed on the need of avoiding middlemen in the cashew industry and urged the MEA to help an agency identified by the state government to inspect the stock and lift raw cashew nuts.

Imports of vegetable oils increase by 15% in June

► The country's import of vegetable oils rose by 15% in June at 13.44 lakh tonnes, according to Solvent Extractors Association (SEA). The import of vegetable oils during June 2017 is reported at 13,44,868 tonnes compared to 11,69,456 tonnes in June 2016, a rise of 15%. This consists of 12,93,777 tonnes of edible oils and 51,091 tonnes of non-edible oils. The overall import of vegetable oils during first eight months of current oil year 2016-17 (November 2016 to June 2017) is reported at 98,63,572 tonnes as compared to 97,63,043 tonnes, more or less of the last year. Currently, soybean, rapeseed and groundnut are being sold below MSP and prices have dropped between 20-30% of last year level. The current prices are the lowest in the last five years and farmers are totally discouraged to sow the oilseeds and may switch over to cotton and other cash crops, B V Mehta, executive director, SEA said. To ensure that farmers do not lose interest in oilseeds cultivation, the association has strongly recommended to the Centre to raise the import duty on crude oil to 20% and refined oil to 35% with immediate effect.

Export of mangoes to South Korea picks up

➤ After initial hiccups, especially related to packing and storage, mango exports to South Korea has picked up. More than 40 tonnes of the 'King of fruits' have been flown to the markets in Seoul so far. The issues that arose after the first few consignments were not about the quality of the mangoes. They were concerning procedures, packaging, cold storage, shelf life and low temperature issues, which were ironed out, said T Sudhakar, DGM of APEDA (Agricultural & Processed Food Products Exports Development Authority).

APEDA and Korean authorities organised a buyer-seller meet in the Korean capital on May 24 and 25, where several concerns were discussed and clarified. Mango varieties were shipped from Mumbai, Bengaluru, Hyderabad, Chennai etc and the demand was very encouraging. There will be a few more consignments exported as the season was coming to an end he informed. A few consignments contained varieties that had a short shelf life and were not packed in boxes to withstand the low temperatures. This has been addressed subsequently. Varieties such as Alphonso, Kesar, Suvarnarekha, Banganapallietc have been exported. A consignment of 2.5 tonnes of the Suvarnarekhavariety was flown via the Rajiv Gandhi International Airport at the end of May.



Indian tea eyes new market in Chile



➤ India is aiming to break new ground in its tea exports with an entry into Chile where it had recently taken a delegation. The existing preferential trade agreement with the Latin American country is being seen as a major catalyst in this foray. The 21 million-kg Chilean tea market is currently dominated by Argentina and Sri Lanka, with some re-traded teas also being sent from some European countries. Indian presence is virtually non-existent.

"We are pretty optimistic about Chile," Santosh Sarangi, deputy chairman and CEO, Tea Board India, said. He said that despite the distance, the Preferential Trade Agreement which gives an 80% margin of preference to tea, will help neutralise the freight costs to Latin America, which were also on a downswing now. "The Indian Tea Association has been pressing for a delegation to Chile since last year," said Sujit Patro,

secretary, Indian Tea Association, who was also a member of the delegation. It may be mentioned here that the PTA signed in March 2006 and was expanded in September. Under the expanded PTA, Chile has offered concessions to India on 1,798 tariff lines with Margin of Preference (MoP) ranging from 30% to 100%. India has offered concessions to Chile on 1,031 tariff lines with MoP ranging from 10% to 100%. Among Latin American countries, Chile is among the leading trading partners of India. Earlier, the same delegation also participated in a food show in the U.S. This, too, is expected to further prise open the U.S. market. "USA is a big market for teas — over 80 million kg, and growing," Mr. Sarangi said. Mr. Patro added that close to 60% of the demand is from the iced tea segment.

Varanasi hub for 'miracle rice' maker

➤ The International Rice Research Institute (IRRI) in the Philippines is set to establish a South Asian Regional Centre in Varanasi that crop scientists say will help improve the yield and quality of rice mainly for eastern Indian states. The Union cabinet chaired by Prime Minister Narendra Modi approved the establishment of the IRRI's regional centre to be hosted at the National Seed Research and Training Centre, a government laboratory in Varanasi, and expected to be commissioned within six months. Indian rice research scientists say the new centre will elevate collaboration with the IRRI that dates back to the 1960s when it worked with Indian scientists to develop IR8, a rice variety with nearly double the yield used in the country then. "The IR8 variety was called miracle rice - it set off the green revolution in rice in India," said Himanshu Pathak, director of the Central Rice Research Institute, Cuttack, Odisha. The IR8 yield was about eight tonnes per hectare compared with about three tonnes available from varieties used across India then. The IR8 was a semi-dwarf variety, Pathak said, and different from the rice varieties cultivated in India during the 1960s that were tall, low-yielding, and were not responsive to fertilisers. Its introduction and rice breeding efforts since then have allowed the country to steadily raise production. Many crop scientists believe the next big jump in rice production in the country is likely to be driven by increasing per hectare yields in the eastern states where the current average production is lower than in other parts of the country. The Varanasi centre will work on special rice varieties to further improve the per hectare yields of rice and improve its nutrition content through modern plant breeding strategies and on post-harvesting activities to reduce wastage, add value and generate higher income for farmers. "We're hoping to get new rice varieties rich in iron and zinc," said Jeet Singh Sandhu, deputy director-general of the Indian Council of Agricultural Research, a member of the coordination committee of the proposed centre. "This will be through conventional breeding - our own scientists are already engaged in efforts to improve the nutritional value of rice. Some varieties rich in protein and zinc have been developed," Sandhu said. Senior officials in the Indian Council of Agricultural Research expect the regional centre to focus on rice varieties for use by farmers in eastern India as well as in South Asian and African countries. "The average per hectare rice yield in many places in eastern India is significantly lower than in the north-western states," said Arvind Nath Singh, director of the National Seed Research and Training Centre that will host the laboratories and infrastructure for the regional centre.

A hardy millet yields its genetic code

➤ In a first, Karnataka's agricultural scientists have sequenced the genetic code of ragi, or finger millet, throwing light on the exact building blocks that make it drought-resistant and nutrition-rich. Scientists from the University of Agricultural Sciences-Bengaluru (UAS-B) achieved the sequencing of the plant, which, the scientists say, was first domesticated from a wild species in Western Uganda and the Ethiopian highlands before being introduced to India around 3,000 BC. The key genetic information revealed by the four-year project will aid further research on ragi, the main crop of dry land farmers. Ragi occupies 12% of global millet cultivation area and Karnataka, which has the second largest drought-prone crop land after Rajasthan, leads in its cultivation. With a low glycemic index, ragi is no longer the poor man's staple, and is preferred by diabetics. Genome sequencing identifies the order of DNA nucleotides in a genome. The ragi project was pursued by an eight-member team headed by Dr. Shailaja Hittalmani, Professor and University Head of Genetics & Plant Breeding, and its report was published in BMC Genomics on June 15. "We have identified 2,866 drought-tolerant genes in ragi besides those responsible for its nutrient qualities," Dr. Hittalmani said.



Scientists grow early-maturing apple varieties

➤ Apple, which was once a monopoly of the upper reaches of Himachal, can reap bargains to the agrarian community of mid hills following successful cultivation of early maturing and superior quality apple varieties by the scientists of Krishi Vigyan Kendra (KVK), Kandaghat, in their experimental farm. Principal Scientist and Head, KVK, Dr DD Sharma said traditional varieties of apple viz., Royal Delicious, Red Delicious, Rich-a-Red etc., had dominated apple cultivation but low yield and the problem of being an alternate fruit bearer necessitated the need to introduce improved varieties of apple from America and Europe. Horticultural Research Station (HRS) and KVK, Kandaghat, pioneered in planting apple varieties obtained from the Horticulture Department viz., Early Red One, Scarlet Spur II, Gale Gala, Gibson Golden, Oregon Spur, Golden Delicious and Granny Smith in 2009.

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HORTICULTURE & MICRO IRRIGATION

Complementing Each Other



Horticulture has emerged as a strong component in Indian agriculture. With consistently outperforming its own production records year on year, horticulture has become a safe bet for farmers. Expanding incomes and changing lifestyle has increased the market demand for horticulture products. The rise in horticulture production has also improved the flow of technology to this segment. Micro irrigation is one such technology which got a major boost due to the expansion of area under horticulture. Government subsidies and policies also appropriately pushed the technology to the forefront. However, over production has also at times resulted in gluts and fall in prices. The horticulture segment therefore needs intervention in the post harvest phase in terms of storage infrastructure and market intelligence.



Indian agriculture has expanded and moved beyond traditional food grain production. With the changing food habits and income dynamics, the scope for production of other food groups has increased. Fruits, vegetables, spices, flowers and medicinal plants have thus offered farmers immense prospects in terms of income increments. Today horticulture has surpassed India's food grains production. The horticultural produce has also crossed Indian borders and added considerable value through exports. Apart from conventional crops, Indian farmers have started experimenting with cultivation of exotic fruits and vegetables with exceptional results. Advances in horticulture production has also considerably improved the technology inclusion and infrastructure expansion. Substantial emphasis is today laid upon micro irrigation, cold storage, Good Agriculture Practices and infrastructure. However, stability has to be attained in terms of price volatility.

Hot Horticulture Production

India has witnessed voluminous increase in horticulture production over the last few years. Significant progress has been made in area expansion resulting in higher production. Over the last decade, the area under horticulture grew by about 2.7 per cent per annum and annual production increased by 7.0 per cent. India witnessed sharper increase in acreage in horticulture crops compared to food grains over the last five years (from 2010-11 to 2014-15). The area under horticulture crops increased around 18 per cent compared to an expansion of area under food grains by 5 per cent during the stipulated period.

Globally, India is the second largest producer of fruits and vegetables. In mango, banana, coconut, cashew, papaya, pomegranate etc., India is the largest producer. India is also the largest producer and exporter of spices. In productivity, India ranks first in grapes, banana, cassava, peas, papaya etc. The Export growth of fresh fruits and vegetables in terms of value is 14% and of processed fruits and vegetables is 16.27%.

States like Andhra Pradesh, Uttar Pradesh, West Bengal, Assam, Bihar, Chattisgarh, Gujarat, Madhya Pradesh, Maharashtra, Odisha, Punjab and Tamil Nadu are leading among vegetables growers, while Uttar Pradesh, Tamil Nadu, Maharashtra, Madhya Pradesh, Telangana, Karnataka, Gujarat, Bihar, Andhra Pradesh and, Gujarat are leading fruit growers in the country.

Being short-duration crops, which can be grown in very small plots of land-say one-tenth of an acre- mostly marginal and small farmers now prefer to grow more vegetables and fruits (with less than 2 hectares) as these crops ensure a quicker cash flow, unlike say, pulses, which may take more than six months from sowing to marketing.

Horticulture has emerged as a bright spot of Indian agriculture. India's horticulture production grew at a phenomenal pace - Indian farmers now produce more than double the quantity of fruits and vegetables compared to what they did in early 2000. Data shows that between 2001-02 and 2016-17, horticulture production rose from a mere 146 million tonnes to 295 million tonnes. During this period, production of foodgrains grew from 213 million tonnes to 273 million tonnes, showing the growing importance



of short duration horticulture crops for Indian farmers.

The horticulture crops were grown in less than 5 per cent of India's gross cropped area, compared to 63 per cent used to grow foodgrains. Maharashtra is the largest producer of fruits in India while West Bengal is the second largest producer of vegetables. While Gujarat grows most amount of spices, Tamil Nadu tops the list of states in the production of flowers.

The production of horticulture crops have outpaced the production of food grain since 2012-13. This year, India is likely to record highest ever production of horticulture produce, including fruits and vegetables. The total production is estimated at 295 million tonnes which is 3.2 % higher than the production a year earlier. The second advance estimate of horticulture production shows that the current year will be the fifth straight year when horticulture production in the country will outstrip the production of food grains. The agriculture ministry has also noted that there has been a concomitant increase in area under the horticulture crops -

Most of the vegetables including onion, potato and tomato will record increase in current year as compared to their production in 2015-16. Production of onion is estimated at 21.6 million tonnes which is an increase of 3% over the previous year. Maharashtra, Karnataka, Madhya Pradesh, Bihar and Gujarat are the major onion producing states in the country.

from 245 lakh hectares in 2015-16 to 249 lakh hectares in 2016-17.

According to the ministry's estimates, based on information provided by the states and Union Territories, the fruits production during the current year is estimated to be 93 million tonnes which is 2.9% higher than the previous year whereas production of vegetables is estimated to be around 175 million tonnes which is 3.5% higher than the production in 2015-16.

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to their production in 2015-16. Production of onion is estimated at 21.6 million tonnes which is an increase of 3% over the previous year. Maharashtra, Karnataka, Madhya Pradesh, Bihar and Gujarat are the major onion producing states in the country.

Similarly, the potato production has increased from 43.4 million tonnes in 2015-16 to 46.5 million tonnes in the current year - which is 7.2% higher than the previous year. Major potato growing states are Uttar Pradesh, West Bengal, Bihar, Gujarat, Madhya Pradesh and Punjab.

"During the current year tomato production is estimated to be around 19.7 million tonnes which is 5.1% higher than the previous year", said the ministry. Madhya Pradesh, Andhra Pradesh, Karnataka, Odisha and Gujarat are the major tomato states in the country.

The second estimate shows that the production of flowers is estimated to be around 2.2 million tonnes which is 2.9% higher than the previous year, while the production of aromatics & medicinal plants is estimated to be around 1.03 million tonnes - which is marginally higher by 0.8% than the previous year. The production of spices is also likely to report increase. Its production is estimated to be around 7.1 million tonnes which is 1.3% higher than the previous year.

Problems of Plenty and More...

While the increased production statistics point to the adoption of better agronomic practices and crop protection techniques, there is one critical area that has been overlooked for years. Price volatility has been the bane of Indian agriculture system. The issue is particularly critical for perishable commodities like fruits and vegetables.

The recent demonetization drive had exposed the fickleness of the

system. The associated fall in prices, coupled with rising costs and low demand, apparently brought about by demonetisation, had forced farmers in Shajapur district of Madhya Pradesh to dump their tomatoes. Scores of farmers dumped their tomatoes on the roads outside mandis and outskirts of the villages as the rate—around Rs 100-120 per quintal, down from Rs 300-400—was less than the input costs. On top of this, they had to pay mandi charges and transportation costs, which have risen due to fuel price hike. Similar situations prevailed in Kolar. Kolar is the biggest vegetable-growing region in Karnataka, and houses Asia's second-largest tomato market. In November, the ruling price of tomatoes in the Kolar market was Rs 3-Rs 5 per kg, or 85% lesser than the same time in 2015. The price of tomatoes crashed to 25 paise/kg, on December 10, 2016 according to some media reports, which had prompted farmers in a Chhattisgarh district to dump nearly 100 tractor-trolleys, or about 45,000 kg, of tomatoes, on a national highway.

The recent farmer protests in different parts of India is also symptomatic of the anomalies existing



in the Indian agriculture marketing system. Madhya Pradesh which was the epicenter of the farmer crisis is incidentally also an agriculturally significant state which has exhibited a stellar growth in the agriculture sphere registering an enviable 11 per cent growth. The crisis in the state precipitated with a bumper onion yield. The state excelled in programmes that vehemently promoted good agriculture production - be it expansion of irrigated area or the schemes meant to encourage agriculture production.

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Horticulture is also an area where income can be improved considerably by application of new technologies. Considering the income prospects from this area, many new technologies are regularly added to this segment

country fall flat in another department – the post harvest phase. In the absence of a sound storage infrastructure and most importantly a post harvest plan, excess production has always spelt doom for farmers. A good harvest or the good price prevailing in one season motivates farmers to cultivate the same crop in more area in the next season. This has always resulted in glut and fall in prices. Absence of a sound storage structures which is deficient both in quality and capacity has always resulted in distress selling.

Moreover, the agriculture extension machinery in the country has never progressed beyond extending usual crop advisories. Market intelligence has never been used extensively to control the cropping patterns in the country. Indian agriculture, especially the perishable commodities, has to follow

market dynamics and cultivate what is in demand rather than the norm. This will allow better prices and better incomes for farmers.

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Horticulture High on Technologies

India has been witnessing a shift towards high value horticulture on back of strong domestic demand. The advance estimates of horticulture production is a proof of this trend. This trend has been consistent for the past five years. Apart from the usual fruits and vegetables, the farmers have started experimenting with several exotic types. This allows year round availability of fruits.

As per information, farmers now grow fruits almost every month. For instance, they may grow fruit such as Kinnow and Murcott in January and February. They grow Loquat in March and April, Ber in May and April, Sapota (Chiku) and Phalsa in May and June, Banarsi Lemon, Pomegranate (Anar) in July and August and November and December, Karonda in August and September, Amla in November and December.

One of the factors that has enabled this kind of production are new technologies. Green house technology is a valuable technology that has garnered enough support from farmers in India. The area under protected cultivation was 0.23% of the total area under the horticulture cultivation in India in FY'2012. The major crops grown in the protected cultivation are Tomato, Capsicum, Cucumber, Melons, Rose, Gerbera, Carnation and Chrysanthemum. The states and union territories that have adopted protected cultivation in the country have increased from 9 states in FY'2007 to 30 states and Union Territories in FY'2012. The states that have consistently expanded the area under protected cultivation for the period of FY'2007-FY'2012 are Andhra Pradesh, Gujarat, Maharashtra, Haryana, Punjab,

Tamil Nadu and West Bengal. Maharashtra and Gujarat had a cumulative area of 5,730.23 hectares and 4,720.72 hectares respectively under the protected cultivation till FY'2012. Other means of protected cultivation such as the shade nets was the second most widely used protected cultivation method in the country. Plastic tunnels had registered a significant growth of 60.5% for the years FY'2007 to FY'2012. The area protected by the plastic tunnels was 4.3% of the total area under the protected cultivation in FY'2012. The area protected by the greenhouses was 2.2% of the total area under protected cultivation in FY'2012. The area under the greenhouses has increased at a CAGR of 49.16% from FY'2007 to FY'2012.

High density planting is also another practice closely followed in horticultural crops. High density planting has a potential to increase yields and reduce cost of production of several horticultural crops. It has already been exploited successfully in Kinnow, Orange, Pineapple, Banana and to some extent, in Apple and Mango. Jain Irrigation Systems Limited (JISL) and Hindustan Coca-Cola Beverages Pvt. Ltd. (HCCBPL) have joined hands through Project Unnati to help farmers adopt Ultra High Density Plantation (UHDP) technique to boost mango yield. Over 25,000 farmers in Tamil Nadu, Andhra Pradesh and Karnataka would be enrolled in project Unnati to adopt Ultra High Density Mango Plantation (UHDP) technique, which will help boost mango yields. HCCBPL & JISL will be investing Rs. 50 crores into project Unnati by 2024. Ultra High Density Plantation is a proven technology, commonly practiced for mango cultivation worldwide and combined with other sustainable agricultural techniques, has the potential to yield upwards of 200% more produce than that by the



traditional method. Project Unnati is aimed at a large scale adoption of UHDP in the country and aims to scale up the project to cover end-to-end fruit supply chain and further optimize delivery. The project to be scaled up over a period of 10 years, is aimed at creating an ecosystem that delivers higher growth and income for farmers and 'Grove to Glass' fruit supply chain and optimizing delivery for Indian brands Maaza and Minute Maid Mango. Project Unnati alone is expected to deliver close to 240KMT fruit by the year 2023 – 24. Ultra High Density Plantation (UHDP) technique enables plantation of nearly 600 trees in an acre, against the conventional method of planting 40 to 70 trees. In traditional mango

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cultivation, trees are allowed to grow as high as possible; they are pruned minimally or not at all. In UHDP, canopy is maintained in such a way as to attain maximum light interception and canopy volume per unit area in early years of plantation. This leads to the orchard attaining full potential in 3-4 years. The gestation period in UHDP is less, and the farmer starts getting returns in the early years, as UHDP orchards start commercial bearing from the 3rd to 4th year onwards against the 7 to 9 years required in traditional planting. This innovative technique has been standardized and commercialized by Jain Irrigation at its R&D farm at Udumalpet, Tamil Nadu where currently 100 acres is under Ultra-High Density Plantation. The technique further utilizes drip irrigation, offering twin benefits to the farmers by improving yield/acre and simultaneously decreasing the quantity of water used per kilo of mango produced.

Microirrigation systems have evolved into indispensable components to guarantee productivity and sustainability in agriculture systems. Unlike the conventional irrigation which is labour intensive, micro irrigation is water efficient, a reason why the government is promoting micro irrigation. Some of the advantages of micro irrigation are saving of fertilizer upto 30%; increase in yield upto 100%; saving of water upto 70%; prevention of weed growth; saving

of energy and improvement in quality of produce.

Micro Irrigation – Micro Managing Water

Micro – irrigation techniques, including drip and sprinkler irrigation, were introduced as water conserving technologies in India. Micro irrigation is frequent application of water directly on or below the soil surface near the root zone of plants. It delivers required and measured quantity of water in relatively small amounts slowly to the individual or groups of plants. Water is applied as continuous drops, tiny streams, or fine spray through emitters placed along a low-pressure delivery system. Such system provides water precisely to plant root zones and maintains ideal moisture conditions for plant growths.

The benefits of micro irrigation and drip irrigation are not restricted to water saving. It increases the productivity and yields of crops due to better air-water ratio thus increasing farm incomes



'MIS help in better quality of agriculture produce'

India can be said as country of farmers, where more than 70% population is engaged in farming activities. Agriculture is biggest consumer of water. Micro irrigation not only helps in saving this natural resource but also helps in rendering better quality to agriculture produce. Micro Irrigation helps in increasing productivity of area which is a must to feed our growing population. To strengthen Rural Economy and increasing farmer's income, Micro Irrigation is (and will) playing a major role.

Government in the last decade has shown a lot of concern towards Micro Irrigation System and excellent policies were brought up. However implementation of these policies is an area of concern. Few states like Gujarat, Andhra Pradesh (including Telengana) have implemented the Government policy in a systematic way and these states have shown good results in implementation part. But there are other states, not showing such type of growth.

Growth can be seen at faster rate in micro irrigation once we enter in PPP model, and let the Government be one of the parts. There is huge demand for Micro Irrigation in India. However, earlier fund allocation to subsidies has worked as a big obstacle in growth of Micro Irrigation in India. This year Government has increased the funds to Rs. 2500 Cr. for micro irrigation subsidy, which is definitely going to show positive results in future. If Fund allocation by Central Government for subsidy for Micro Irrigation System is taken as criteria of growth of business, then in a span of 7 years, it has increased by 46% (Fund allocated for Micro Irrigation in FY 2010-11 was Rs. 997 Cr. and in FY 2016-17 was Rs. 1455 Cr.). There are many challenges faced by Micro Irrigation industry in India. Fund allocation by various Governments to subsidies was too less than the requirement. Lack of awareness among farmers has been a deterrent in adoption of this system. Different states have different policies, which changes every year.



Mr. Denish Kansagra
Managing Director
SagarPolytechnik Ltd, Rajkot

The benefits of micro irrigation and drip irrigation are not restricted to water saving. It increases the productivity and yields of crops due to better air: water ratio thus increasing farm incomes. It considerably reduces weed problems and soil erosion as the water is applied directly to the root zone in very small quantities. The technique also reduces atmospheric humidity which may reduce the occurrence of pests and diseases. It also reduces problems of water logging, salinity and ground water pollution. The continuous application of water in small quantities helps keep the salt concentration below the harmful levels. It reduces the cost of cultivation mainly due to savings in labour costs and energy savings. According to certain estimates, the system can save electricity of 278 kWhr/ha for wide spaced orchard crops and 100 kWhr/ha for closely grown crops. The continuous and

uniform application of water across the field will also improve the quality of produce. Combining micro irrigation with water soluble fertilizers, fertigation is a recommended practice in horticultural crops. The fertilizer use efficiency can be increased up to 95% using this system when compared to conventional methods of water application. Moreover, micro irrigation is well suited to all soil types and undulating terrains as the water flow rate can be controlled.

At present, United States (1.64 million ha), China (1.67 million ha) and Spain (1.63 million ha) are some of the leading countries which have adopted drip irrigation. Considering the world's total irrigated area as 212 million ha, only 4.75% of it is currently irrigated under drip irrigation which shows the immense potential that still exists for this kind of irrigation.

India, with a total arable area of 140 million ha with almost 42% of

arable land irrigated, too has a huge potential for micro – irrigation which is still underutilized. Task Force on Micro – Irrigation (2004) estimated a potential of 27 million ha for drip irrigation based on the area under crops most suitable for that form of irrigation, the Indian Committee on Irrigation and Drainage (INCID) estimates a potential of 10.5 million ha.

In India, Maharashtra (0.48 million ha), Andhra Pradesh (0.36 million ha) and Karnataka (0.17 million ha) account for more than 70% of the total area under drip irrigation. However, the total area covered under drip irrigation (1.42 million ha) is still quite low as compared to the potential area of 11.6 million hectares. While Andhra Pradesh (50% of Potential) and Maharashtra (43% of Potential) have been able to bring substantial area under drip irrigation, other states lag far behind.

MIS has Multiple Advantages



Arun Rokad
CEO, Om Irritech Ltd.,
Rajkot, Gujarat

"Until now the Indian market for Micro Irrigation has been very tough. However, in the last 2-3 years, all the Farmers have understood the need of micro Irrigation and they have come forward to adopt micro Irrigation in their field without any support or any hesitation. This must be considering the multiple advantages of adopting Micro Irrigation systems (MIS). MIS saves water up to 80% when compared to conventional irrigation system as water is applied directly to root zone so majority of water is absorbed by the plant root. This method of irrigation reduces the use of weedcides also, as there is no water/wet land except the root zone for weeds to grow. Farmers can also save weedcides cost as there is no weed in the field. Required fertilizers can be directly applied to the root zone through micro irrigation system thereby optimizing the fertilizer uses and also cost. Daily but controlled irrigation enhances the plant vigor and thus makes the plant healthy to fight against any pest/disease attack. Reduced Fertilizer, pesticides and weedcides application can save Labour and the associated

cost involved. Besides these advantages, the adoption of MIS is less. One of the reasons could be the high system cost. Low literacy rate among farmers have also discouraged the adoption of MIS. Water quality is an important parameter in MIS. In many states in India, there is high content of salts in water which badly affects the life of MIS. Till now the players in this field have been unable to plant the idea of MIS in the mind of farmers. The government, however, is encouraging farmers to adopt the MIS by means of subsidy. General farmers can avail 70% subsidy on purchase of MIS. Apart from this prime minister of India has schemes like Pradhan Mantri Krishi Sinchayi Yojana also supports MIS".

Micro Irrigation systems have also seen several upgrades, one among which is the Automated Irrigation System which requires just a minimum of manual intervention besides the surveillance. Automated with the help of timers, sensors or computers or mechanical appliances, it makes the irrigation process more efficient besides considerably reducing the labour charges. However, under the current context, such systems can be expensive and the complexity of the designs may warrant experts to plan and implement. Also, solar energy has replaced electricity which comes in useful in remote locations beyond the reach of electric power lines. According to experts, Solar Photovoltaic (PV) panel is one of the simplest possible ways to generate electricity beyond the reach of power lines. It has no moving parts and lasts for decades with virtually no maintenance. Solar power is no longer an expensive, experimental energy source.

Despite these apparent benefits,



farmers across the country have been reluctant to adopt this on a wide scale. High initial costs make the technology unfeasible for small and marginal farmers. Installation of a drip irrigation system requires an initial investment of up to Rs. 1,25,000 per hectare according to some estimates. The system requires proper filtration so that dust and other particles do not block the small emitter holes and sometimes it entails high emitter clogging rates. Drip Irrigation has been used for irrigating only a few selected crops in India. It is adopted mostly for coconut (19% penetration), banana

(11%), grapes (10%), mango (9.4%), citrus fruits (7.9%) and pomegranate (6.2%). It may not be suitable for closely planted crops like cereal grains which are grown across large areas in the country. Lack of technical support and follow up by the government, private companies and NGOs may be a hindrance for adoption. Only selected, pre-approved drip kits qualify for the subsidy which stifles creative marketing strategies on the part of manufacturers as well as efforts to bring down the cost of drip systems through innovative technology or product designs.

Micro irrigation is crucial for agriculture in years to come. With the water resources continually on the decline, call for sensible water management has strengthened in India. Micro irrigation systems guarantee sustainable water use and hence a more productive agriculture system. Horticulture, being on the high value side, can gain immense benefits from micro irrigation systems.

INTERNATIONAL AGRICULTURE CONSULTING GROUP

Indian initiative towards food and agriculture solutions

Vision

Our vision is to be a leading provider of Indian regional expertise in food and agriculture and to outstand as key advisory partners on food security concerns, policy planning and strategy framework for sustainable development through agriculture.

Mission

Our mission is to initiate and support micro and macro level changes in agriculture by providing Indian expertise and solutions for research, extension, education, training, institutional frame, policy planning, agribusiness and project consulting so as to address their major agricultural concerns relating to farm production, food security, environment sustainability, rural employment, economic growth and human resource development.

Objectives

1. Provide Indian expertise to deliver solutions to agricultural issues and concerns through formulation of agro and rural development projects, farming solutions, micro and macro level national agriculture planning, policy support, organized research, extension infrastructure and institutional set-ups, value addition and market linkage services.
2. Manage short terms management programs, training and entrepreneurship course for farmers, research & extension personnel, officials and professionals of various countries while recognizing and understanding ecological, technological, social and economic concerns related to their food and agriculture sector.
3. Facilitating students from different countries in enrolling in food and agricultural degree programs; management and entrepreneurship courses offered by various institutes and recognized universities of India, so as to help various countries in developing human resource for creative and productive change at ground level.
4. Organizing delegation level visits from India to various countries and of different countries to India for participation in agri and business summits, learning and exposure at technology institutions, agri universities, model farms etc., and discussing possibilities for joint ventures, collaborations and promoting better understanding in agriculture and agribusiness.
5. Facilitating Governments, Corporates or Institutions to venture globally and act as total solutions providers in implementation of foreign agriculture projects by providing research structure, technical assistance and investment planning in food, farming, agribusiness or agriculture development programs.



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'WITH THE HELP OF MICRO IRRIGATION SYSTEMS, THE CROP YIELDS INCREASE SUBSTANTIALLY'

Jain Irrigation Systems Limited (JISL) with more than 10,500+ associates worldwide and revenue of USD 1 Billion, is an Indian multinational company with manufacturing plants in 30 locations across the globe. JISL, its subsidiaries and associates are engaged in providing solutions in agriculture, piping, infrastructure through manufacturing of Micro Irrigation Systems, PVC Pipes, HDPE Pipes, Plastic Sheets, Agro Processed Products, Renewable Energy Solutions, Tissue Culture Plants, Financial Services and other agricultural inputs since more than 34 years. It has pioneered a silent Productivity Revolution with modern irrigation systems and innovative technologies in order to save precious water and has helped to get significant increase in crop yields, especially for more than 6 million small farmers. It has also ushered in new concept of large scale Integrated Irrigation Projects (IIP). 'More Crop Per Drop™' is the company's approach to water security and food security. In a discussion with Agriculture Today, Mr. Anil Jain, Vice Chairman & MD, Jain Irrigation Systems Ltd talks about the Micro Irrigation Systems and their relevance in India.



What convinced Jain Irrigation to enter the business of Micro Irrigation Systems?

Our Founder Chairman had two dreams -to save natural resources such as water, forest, energy etc., and to increase farmers' income. Therefore one of the objectives of Jain Irrigation was to increase farmers' income. Water is a vital input for increasing crop production and therefore, agricultural income. Use of micro irrigation systems result not only in saving of water but also increase in crop productivity. Through micro irrigation, fertigation

i.e., application of fertilizers to the root zone of the plants is possible. This results in water saving, fertilizer saving and increase in Water Use Efficiency and also Fertilizer use Efficiency. Besides this, micro irrigation saves energy, can be used in undulating terrains, improves soil health, etc. Because of multifold advantages of micro irrigation, it is known to be the only technological solution to increase Water Use Efficiency and water productivity of Indian farmers. This has convinced Jain Irrigation to enter in to this field.

How healthy is the MIS industry in India?

The MI industry is quite healthy though there are some challenges. There are about 200 small companies in the micro irrigation segment. The industry growth is to the tune of 15-20 %. Many times, in summer we are not able to match the requirements and are unable to supply the systems to farmers on time. Some industry players must improve quality to ensure total satisfaction of farmers.

Over your more than three

decades of presence in India, how have farmers adapted to MIS?

Initially the farmers were reluctant to adopt micro irrigation systems. They always had a doubt in their mind that how this drop by drop technology will fulfill the water requirements of my crop. Particularly Banana and Sugarcane farmers were very reluctant. But slowly they started using the systems and took advantage of subsidy by the government. MI companies like Jain Irrigation took the lead and started providing package of services including turnkey jobs of micro irrigation installations and providing agronomical services to enhance farmers' income. They succeeded in that and the farmers adopted the systems on a large scale. In southern and western states, the adoption levels are high because of awareness about water shortages and advantages of micro irrigation systems. In eastern and north-east states, the adoption levels are low.

What are the yield advantages related to MIS?

With the help of micro irrigation systems, the crop yields increase substantially. In flow/flood irrigation, the irrigation water is applied at certain rotation. The rotation period varies between 10-15 days or sometimes even more. Thus whenever the water is applied, soil gets saturated and there is no aeration in the root zone of the plants. After 2-3 days, the soil comes at field capacity level which is a favourable condition for growth of the plants. Next 2-3 days, the water is evaporated, percolated or transpired through the leaves of the plants. Thus the soil becomes dry. This is called a wilting point - when we decide to irrigate again. In wilting point condition, there is no water in the root zone of the plants and plants suffer because of water stress. In nutshell, in flood irrigation, plants suffer because of strain and stress and grows only half of the time available. But in micro irrigation soils are maintained at field capacity levels all



the time and therefore ensures proper vegetative and reproductive growth everyday. This enhances the yields of the crop. For example: sugarcane in Maharashtra is 33 tonnes per acre and it has gone upto 100 tonnes for some farmers in the case of micro irrigation systems. Banana yield can also go up to 25 kg /bunch in micro irrigation from flood irrigated 12-14 Kg/bunch. This is possible because of fertigation. Because in micro irrigation one can apply fertilizers through the systems very effectively near the rootzone of the plants.

How has the government policies changed over the years with respect to MIS?

Government has been supportive and support has been increasing. Initially Maharashtra government followed by AP and Gujarat promoted the concept by way of providing subsidy and by way of floating SPV (Special Purpose Vehicle). Central government has also support. Now there is a subsidy to the tune of total 80-90% in some states. However, the subsidy is sometimes delayed. Apart from the well irrigated areas, government of India is supporting micro irrigation in canal

command areas also. They have made it mandatory for 30% area in canal command area. Hence integrated micro irrigation projects are being undertaken with government funding. However, focus now has been shifted to 'Direct Benefit Transfer' to farmers.

How will GST affect MIS industry?

Higher slab of GST will increase the prices and therefore may affect the MIS industry for some period of time. Eventually it shall stabilize and improve overall situation.

What are the challenges faced by this segment in India?

Low awareness levels about the technology; No understanding of the true 'value of water'; Delayed credit supply; Lack of training and capacity building; Poor extension work; Lack of skilled manpower for survey, designing and installation of the systems; Varied climatic conditions in the country and vast country size which takes time for penetration and Lengthy and cumbersome subsidy procedure are some of the challenges faced by this industry.

'MIS WILL ACCELERATE THE GROWTH OF INDIAN AGRICULTURE'

Rivulis® operates in over 100 countries by virtue of the presence of its predecessor John Deere Water that had earlier acquired Plastro Irrigation from Israel; Roberts Irrigation and T-Systems from the USA; and also the recent merger with Eurodrip. Rivulis offers complete range of micro irrigation components including round and flat drip lines, drip tapes, filters, hose and tubing, mini and midi sprinklers, foggers, misters, online emitters and valves etc. Rivulis Irrigation India Pvt Ltd is 100% subsidiary of Rivulis Irrigation Ltd, Israel. The company sells water management solutions in more than 30 countries and has distribution partnership in 100 plus nations. It has 15 manufacturing facilities in 13 countries. In many ways, Rivulis is setting new standards for the irrigation in India by embracing innovation in the field of Micro-Irrigation. Currently Rivulis Irrigation holds approximately 12% market share globally. In conversation with Agriculture Today, Kaushal Jaiswal, Managing Director, Rivulis Irrigation India Pvt. Ltd. discusses the extent of adoption of micro irrigation in India.



How different or same is the Micro Irrigation Systems (MIS) in India when compared to other countries?

The penetration of Micro-irrigation in India is very low as compared to the countries like Israel, Russia, US, Brazil, etc. Israel has almost 90% of their cultivable land under drip irrigation, while in India the penetration is about 6%. That means still 94 % of the cultivable land in India is either dependent on rain or flood irrigation. As far as Drip Irrigation Systems are concerned it is customized according to the terrain/crop/soil type. Considering the water requirement of the crop and available water source, our experts design and install the system according to needs of the farmer. We follow the same standards across the globe.

How is MIS compatible under Indian conditions where farmlands are fragmented and

farmers are mostly small scale and marginal farmers?

In India more than 200 million farmers own small tracts of land. And yes you are right that affordability and initial cost of the system is an issue with small and marginal farmers. To encourage these farmers Govt of India has announced different schemes like PMKSY (Pradhan Mantri

Krishi Seenchai Yojna) with the key objective of "Har Khet ko paani" and Govt is providing 50-90 % subsidy to encourage the farmers to adopt Drip Irrigation. Bank loans are also available. This year Govt of India has increased the budget for Micro Irrigation. Govt is also promoting community irrigation schemes where group of farmers can join hands and avail the facility. MIS



will only accelerate the growth of Indian Agriculture providing efficient irrigation solutions to Indian farmers where they will irrigate the CROP and not the FIELD.

How important is MIS for Indian agriculture?

Water is the most critical resource for the development of the Agriculture. The twin challenge for India is to feed the growing population and second is the water scarcity. India's population is expected to reach 1.6 billion by the year 2050. Feeding the growing population is a major challenge ahead for agriculture in India. Even though the production of the food grains has increased, we still struggle to meet the demand due to high population growth rate. The erratic rainfall in India adds more to water and food deficit. Almost 50% of India faces high to extreme water stress. MIS increases water efficiency by 50-90 %. It is also a proven fact that using fertilizer through fertigation method will reduce the fertilizer uses by more than 25%. Then there is lot of saving in energy consumption and irrigation cost. With the assured water and right amount of fertilizer through fertigation there will be an assured increase in productivity. Time has come where we need to appreciate the fact that water is precious and a limited resource. Micro-Irrigation system has the efficiency and can go a long way in addressing the problems faced by the agriculture sector in India.

How significant is the government support in popularizing MIS in India?

The Micro-Irrigation technology has received considerable attention from policy makers and Government for its ability to contribute significantly towards agriculture productivity and economic growth. Recognizing the importance of micro irrigation, the government has taken various initiatives since 1992. The first real thrust however came in 2006, when the government launched a Centrally Sponsored Scheme (CSS) for micro irrigation. This was later upgraded to the National Mission on Micro Irrigation (NMMI) and was implemented through the year 2013-14. The current government's manifesto has talked about "Har Khet Ko Paani" with Honourable Prime Minister's mantra of "Per Drop More Crop". Pradhan Mantri Krishi Sinchayee Yojna (PMKSY) was launched in 2015, integrating micro irrigation in the flagship scheme as an integral component. The scheme focusses on providing an end-to-end solution to the irrigation supply chain. One key differentiator for micro irrigation is that when compared to other components of this scheme, which include creating infrastructure to bring water to farms and



watershed development, micro irrigation presents a quick-win opportunity for all the stakeholders where the implementation can be seen on ground within months.

What are the challenges encountered by this industry?

Despite the stated focus on micro irrigation, the current situation on the ground shows a different picture which has led to lower adoption rates. While each government initiative in the past decade has had its own merits and shortcomings, there are a few fundamental challenges that have not yet been dealt with. Farmers face major challenges in finding financing option for the micro irrigation products and in case they do find a financing source, there are high collateral demands. Tracking the installation of a micro irrigation system, step by-step, from initiation of work order to installation and payment is still not possible in a majority of states, which is a major source of inefficiency in the system where IT can play an important role. Also the teams that are implementing the micro-irrigation schemes in various states (with an exception of few) are not dedicated for the said implementation, hence a focused approach is missing. Subsidy disbursement process continues to be a big impediment in the growth of the industry. There is lack of uniformity in subsidy disbursement process and it varies from state to state. Delay in subsidy disbursement in some states is also a big challenge.

'MICRO IRRIGATION-AN IDEAL SOLUTION COMPARED TO THE TRADITIONAL IRRIGATION METHOD'

EPC, a Mahindra group company, popularly known as EPC Irrigation, is a pioneer of micro-irrigation in India. With Mahindra and Mahindra Ltd. (M&M) acquiring a majority stake in EPC Industrié Ltd through preferential issuance of equity shares, M&M entered Micro-Irrigation Sector. Started in 1986 with the initial French Technology support, EPC had developed the capability to design and develop the irrigation products of international standards, satisfying every need of Indian farmers. EPC provides complete solution for agriculture with a focus on Micro-Irrigation, Pumps & inter-related requirements of fertigation & agronomic support. EPC is also planning to enter another allied business activities in future. The company is registered in all major states under subsidy program in India. EPC has a strong and widely spread network of large number of channel partners and is supported by offices at strategic locations. EPC has also launched first of its kind one stop shop for agro products & solutions (Agri Showroom) in Buldhana district of Maharashtra, wherein farmers can find all agri input products & services under a single roof. In an interview with Agriculture Today, Ashok Sharma, Managing Director, EPC Industries Limited, discusses the micro irrigation scenario prevailing in India and its relevance for Indian farmers.



What is the status of Micro irrigation in India?

Though India has the largest irrigated area in the world, the area under irrigation is only about 40% of the total cropped area as of today. One of the main reasons for low coverage of irrigation is the predominant use of flood method of irrigation, where water use efficiency is very low due to various reasons. Even after substantial promotional efforts by the government and private organizations, the rate of adoption of MI technology has been rather low. Out of the total estimated potential of 69.5 million hectares, the current area under micro-irrigation is only 7.7 million hectares. The adoption level is much lower compared to countries like Israel and US, where the average penetration is 90% and 55% respectively. Only six states in India—Rajasthan, Maharashtra,

Andhra Pradesh, Karnataka, Gujarat and Haryana—account for over 80% of India's micro-irrigation coverage. However, the situation is expected to change. With the continuous expansion in population and rapid growth of industrialization, demand for water is constantly increasing. Agriculture being the major water consuming sector in India, demand management in this sector becomes even more important. Given the increasing requirements, the share of water for Agriculture sector is expected to come down from over 80% currently to 69% by the year 2025 and hence, the demand for micro irrigation is bound to go up.

How well Micro Irrigation industry is performing in India?

There are primarily two major micro-irrigation practices adopted in India –

drip irrigation and sprinkler irrigation. Drip irrigation uses a network of pipes to deliver water directly to the root zone of a crop while the sprinkler method uses sprinklers to simulate rainfall and irrigate a patch of farmland. The irrigation method is determined by different crops and their differing water needs. While drip irrigation is naturally more efficient than sprinkler irrigation, which inevitably does result in a loss of water to evaporation, both methods are vastly more beneficial compared to traditional flood irrigation methods. Although the industry is dominated by sprinkler irrigation, which contributes to about 55% of the total, India has mammoth potential for both the irrigation methods. The domestic industry is currently sized at around Rs. 4,500-5,000 crores and is highly competitive. There are more than 100 large and small scale drip and sprinkler

irrigation systems producers and marketers across different states. Major players include Jain Irrigation, Netafim India, Finolex and EPC Industries Ltd. Jain Irrigation commands a market share of more than 30% and Netafim India has a market share of about 18%. The industry has been growing at a CAGR of 5-7%. However, given the increasing requirement of water management, according to some estimates, the total market in India is expected to be more than Rs. 8,000 crores by 2020.

Is Micro Irrigation system an ideal solution for small scale and marginal farmers?

Micro Irrigation system has multiple advantages compared to the traditional methods of irrigation. The targeted application of water helps in maintaining the soil moisture at optimum levels. This helps in increasing the productivity of crops. In the regions and crops where farmers have adopted micro irrigation they have experienced significant benefits. Micro Irrigation has the ability to increase productivity, reduce weeds and also result in significant savings on electricity, apart from its ability to conserve water. Given that our country is largely dominated by small and marginal farmers, one of the perceived reasons for low penetration of micro-irrigation is the high capital requirement. However, research states that the average benefit to cost ratio outweighs the installation cost across the states. Hence, micro irrigation is an ideal solution compared to the traditional irrigation method, in any given situation. In order to demonstrate these benefits and positively impact the productivity, at EPC we have around 200 demo plots across the country that serve as model farms for farmers to see and believe the impact.

How are the subsidy programmes effective in popularizing MIS in India?

The growth of micro irrigation industry, in the short run, is largely dependent on the government policies and release of subsidies. Provision of subsidies under the schemes like Pradhan Mantri Krishi

Sinchai Yojana (PMKSY) is conceived to improve efficiency by expanding the irrigated area. These subsidies have certainly provided an initial push for the adoption of micro-irrigation. However, one of the major challenges faced by the micro irrigation industry is the disbursement of these subsidies. The slow movement and allocation of funds can lead to decrease in pace of adoption in certain states, thus causing stress in the industry. A single window clearance system, like the one implemented by Gujarat has been very effective in increasing the penetration of micro irrigation. According to a research, area under micro irrigation has increased by 17% CAGR (from 0.31 mn ha to 0.83 mn ha) from 2009 to 2015 in Gujarat. Similar steps by other governments can lead to encouraging results, eventually leading to farmer prosperity.

How is the policy support from government in this segment?

Government, through its centrally sponsored scheme of Pradhan Mantri Krishi Sinchayee Yojana, has been focusing a lot on micro irrigation in the last few years. In fact during this year's budget, government announced the creation of a dedicated micro-irrigation fund to achieve the goal of 'Per Drop More Crop'. However, the challenge that the industry faces demands much more than the allocation of funds. The micro irrigation industry in the country expects timely and simplified implementation of the subsidy schemes. Unavailability of subsidy funds for installations already approved, delayed release of funds and identification of beneficiaries etc. lead to significant delays. Hence, apart from allocating the funds, the government also needs to ensure smooth implementation of the subsidy system in order to promote the adoption of micro-irrigation in the country.

How will GST affect MIS companies and its customers?

In the larger context of taxation, GST will have a very beneficial impact on the industry and MIS industry in particular. In one stroke, the issues of mul-

tiple taxation, excessive paperwork, cascading effect of taxation, unscrupulous practices like tax evasion, check on use of non-virgin material etc. will all get arrested and thereby the cost and quality of the produce is likely to be positively impacted. However, the industry fears that the announced rate of 18% is on the higher side for a subsidized industry having a special focus of the government. This would make the end product much more expensive to the farmers and may be looked upon as a disincentive for investing in Micro-irrigation.

What are the challenges in implementing MIS in India and how can we overcome it?

One of the major challenges that this industry has faced over the years is the disbursement of subsidies. Being a subsidy driven industry, any delay in allocation of funds results in stress in the industry. Apart from this, the adoption has also been slow due to the low level of awareness in the country. While some states like Maharashtra, Rajasthan and Gujarat etc. have done well, others still have a long way to go. The need of the hour is to educate the individual farmers about the benefits of micro irrigation. Studies by agronomists have shown that the real reason behind non-adoption of micro irrigation is not that of affordability but a general lack of awareness about the benefits: both economic and agricultural. In order to overcome these challenges and promote the adoption of micro irrigation, government needs to ensure timely disbursement of subsidies. A single window system (drawing from the successful Gujarat model) for creating awareness, sanctioning cases & disbursing subsidies can go a long way in ensuring success. Another solution could be moderating subsidy levels in states where penetration of micro irrigation is already above the national average and re-routing that subsidy to states where the adoption level is rather low and the technology is yet to penetrate. Apart from this, ensuring adequate financing mechanism for the farmers could also increase the penetration.

'AGRICULTURE PRODUCE MARKETING SHALL BENEFIT TREMENDOUSLY FROM ONLINE BUSINESS GROWTH'

Founded in December 2011, Bigbasket is one of the largest online food and grocery companies with operation in 18 cities across India. The Bengaluru-based online grocery startup deals with over 15,000 products comprising groceries, fruits and vegetables, dairy products, personal products, kid products, and wide range of household products. In an interview with Agriculture Today, Vipul Mittal, Head, Fruits & Vegetables, Bigbasket.com discusses the business model of the company.

How did the idea of bigbasket evolve?

Bigbasket was founded in Dec 2011 by a team of seasoned entrepreneurs who had deep hands on understanding of the retail business. The eco system around E-commerce was ripe and the mature entrepreneurs could sense the opportunity before others. They already had run the first online grocery business way back in 1999 and the learnings were with them to lay the foundations of a large and successful e-commerce business in grocery.

How does bigbasket source fruits and vegetables? Is there any contract arrangements with farmers?

Bigbasket understands the immense disintermediation opportunity provided by online grocery business, for perishables like fruits and vegetables. This has prompted us to set up collection center's in rural areas across the country and create direct farm linkages through our 'Farmer Connect' program. We currently have 20 CCs across 11 states in the country, which in turn cater to sourcing from around 5000 farmers. We do not enter into any contract farming arrangement, but



Bigbasket understands the immense disintermediation opportunity provided by online grocery business, for perishables like fruits and vegetables. This has prompted us to set up collection center's in rural areas across the country and create direct farm linkages through our 'Farmer Connect' program

rather give the farmers the benefit of market pricing, while giving them the assurance of sales volumes. We register each farmer through a software and monitor the progress of his crop journey through an app based software administered by trained company agronomists. The commercial transaction takes place at the Village level with complete transparency on quality, quantity and prices. The payments are made online within 24 hours of procurement at the CC. The farmers tend to gain due to assured demand, coupled by better prices, lesser overheads and efforts. They also benefit from the advisory given by the agronomist from time to time to help them practice sustainable agriculture.

How big is the domestic market for organic fruits and vegetables?

The Total Domestic market for Organic Food is very small and nascent as compared to the around \$300 billion grocery retail market. One estimate puts the total organic Food & Grocery market size at Rs 1100 crores. The total organic fruits and vegetables market suffers from lack of reliability around the

organic produce, coupled with the issues of certification and pricing. Many players are keen to harness the opportunity but do not have the ability to marry production with market and protect the interests on both the sides. Bigbasket is in a unique position to do the same, being an online player with direct engagement with organic farmers.

Are there any quality standards or certification that bigbasket insists upon for procurement from farmers?

For organic produce we encourage the farmers to register under the PGS system of certification. Alternately we buy from farmer groups or large farmers who have NPOP certifications for their produce.

How significant is Good Agriculture Practices (GAP) for firms like bigbasket?

GAP is a nice idea. The challenge is in implementation and maintaining the price competitiveness. We would be very keen to train our farmers on the same and graduate them in this direction albeit without increasing the overall cost for the consumers. We are exploring opportunities to convert our entire farmer base onto GAP certification.

What were the difficulties encountered while marketing perishable commodities like fruits and vegetables?

Fresh fruits and vegetables have a whole lot of challenges. The biggest being its perishable nature, thus matching the demand and supply

on a constant basis. Any mismatch leads to loss of sales opportunity or dump. Lack of quality standards and processes across supply chain makes matter worse. In the absence of aggregated volumes of individual players, there is need for credible aggregators to add value.

What are the future prospects of online marketing of agriculture produce?

Online business requires large investments to sustain and reach a breakeven level. However, it is most well suited for short shelf life and perishable products. Agriculture produce marketing shall benefit tremendously from online business growth. Farmers would enjoy greater price transparency and better share of the customer rupee.



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Eco-friendly neem coated urea: A boon for farmers



Fertilizer nitrogen (N) has played a key role in food grain production, although its use efficiency (20-50%) is very low in India and recovery of residual N to succeeding crops is also very limited. Although N is essential for agricultural productivity, imprudent use of large amounts of nitrogenous fertilizers impair the environmental quality through gaseous emissions of methane, nitrous oxide (N₂O), ammonia (NH₃), etc. affecting soil, human and animal health. An effective N fertilizer management involves development and production of slow release N fertilizer and/or indigenous urease nitrification inhibitors, to inhibit the nitrification process. Inhibiting nitrification could be a key strategy to improve N recovery and agronomic

N use efficiency. Neem (*Azadirachta indica* L. Juss) based fertilizer is one of the best ways for augmenting N use efficiency, crop productivity, and safeguarding the environment through its nitrification inhibiting properties.

Indian neem tree is a tall perennial tree growing widely in the tropics and sub-tropics, which sheds fruit during the summer months of May to July. The properties of neem as insecticide, antifeedant, hormonal, antifungal, antiviral, nematocidal, spermicidal and other biological activities are well documented. These activities are brought out with neem use in the form of leaves, leaf extracts, seeds, cakes, oil and fruit extracts. Neem oil extracted from the seeds is generally used to manufacture soaps and pesticides. The cake (5% N) left after oil extraction is generally used

as organic manure in paddy, cotton and sugarcane, and also used for making neem cake-coated urea. Neem seed cake also reduces alkalinity in soil, as it produces organic acids on decomposition. As a natural product, it is compatible with soil microbes, improves rhizosphere micro flora and ensures fertility of the soil too. Besides, improvement in soil texture, water holding capacity, and soil aeration are also reported.

A series of studies on neem based urea products at different locations in India as well as abroad revealed that application of neem based products viz., neem cake or neem-oil coated urea significantly enhanced the crop yield, N use efficiency and soil health as compared to other modified/coated urea or prilled urea. The application of neem based urea is effective in

reducing the rate of nitrification and providing efficient fertilization for plant growth and productivity.

Why neem coated urea (NCU)?

When prilled (normal) urea is applied to the soil, amide form of urea is rapidly converted to ammoniacal nitrogen and subsequently to nitrite and nitrate form by the action of nitrifying bacteria viz. *Nitrosomonas* species and *Nitrobacter* species, respectively. Nitrogen in these forms, besides being absorbed by plants is also rapidly lost from the soil. Quite a high proportion of the applied nitrogen is lost in one or the other way, due to volatilization (8-10%), leaching, runoff and denitrification causing serious disruptions in ecosystem functions. The processes of hydrolysis and nitrification of urea fertilizer are to a large extent completed in about 15–20 days under most agroclimatic conditions. NCU when applied to the soil, the neem triterpenes inhibit the activity of nitrifying bacteria, resulting in delayed transformation of ammoniacal nitrogen ($\text{NH}_4 + \text{N}$) into nitrite nitrogen ($\text{NO}_3\text{-N}$). The coating of urea with neem cake also acts as a physical barrier, slowing down the process of solubility and volatility due to its anti-bacterial process. This means it stays in the soil for longer period strengthening its effectiveness and nourishing the crop and avoiding the repeated use of fertilizers. Ensuring slow and continuous availability of N throughout the crop growth period made NCU urea popular. NCU is required less in quantity with same field size and gives higher crop yields than normal urea. Since NCU is not suitable for industrial use, its chances of illegal diversion to industries is minimal. Use of NCU also reduces the carbon-footprint and is more environment friendly.

Technology for NCU

As early in 1980s, nitrification inhibiting (NI) properties of neem and its role in increased NUE was reported by many workers. The positive response of neem based urea on crop yield and apparent efficiency of applied N, Indian Council of Agricultural Research (ICAR) in its publication entitled "Technology for Rice Production" for different states has recommended the use of neem cake blended/coated urea. The coating procedure involves use of making slurry of coaltar and kerosene, physical mixing with urea and followed by the addition of finely powdered neem cake and finally drying the finished products before use in field. Despite highly promising results with the use of neem coated urea, the practice has not caught the attention of the farmers. Also mass production of NCU was industrially not feasible due to some limitations with the indigenous technique. But now-a-days, the industrial and commercial organizations have undertaken solid steps for developing a ready-to-use product by eliminating the possible limitations in preparation of NCU. ICAR- Indian Agricultural

Research Institute (IARI), New Delhi has fine-tuned a urea coating technology employing neem oil emulsion at 0.5 to 1.0 kg/tonne of urea. This technique or its modifications are currently used in India by several fertilizer manufacturers.

NCU on crop yield

Neem cake coated urea, developed at ICAR-IARI, New Delhi was primarily based on the nitrification inhibiting properties of neem, although some slow release properties were due to the carbon present in the neem cake. Neem coating leads to more gradual release of urea, helping plants gain more nutrients and resulting in higher crop yields and NUE.

Results on NCU/ neem cake coating/blending of prilled urea are available from extensively conducted field trials on several crops viz., rice, wheat, maize, sugarcane, cotton and potato in India and overseas. In general about 4–22.3% increase in grain yield with neem based urea products over the prilled urea has been reported and average increase was 9.6% in crop yield in various crops at different locations. Besides, increased grain yield, NCU also enhanced the efficiency of urea fertilizers. In general, 8.2-22 % increase in apparent recoveries of applied N in various crops with NCU was reported because probably use of NCU inhibits the process of nitrification, which in turn increases the nitrogen availability to crops.

NCU on soil health and environment quality

Non-judicious use of nitrogen (prilled urea) is lost via ammonia (NH_3) volatilization, denitrification, and leaching, causing serious threat to ecosystem. Loss through volatilization occurs when the denitrifying bacteria reduce the nitrate to nitrogen and nitrous oxide which escape to the stratosphere and cause ozone depletion and also contribute to greenhouse warming. Nitrate formed as result of rapid hydrolysis and nitrification of urea, being highly soluble is liable to be leached down the soil profile, beyond the active root zone of the crops. Leaching not only





depletes precious nitrate but also takes away clay, soil, and organic matter, leading to low soil fertility and low plant-available water reserves. Blue baby syndrome can also be caused by methemoglobinemia, it is widely believed to be caused by nitrate contamination in groundwater bodies resulting in decreased oxygen carrying capacity of hemoglobin in babies leading to death. Therefore, these problems can be curtailed through use of NCU in place of normal urea. Nitrification inhibitory properties of neem cake are responsible for higher exchangeable soil $\text{NH}_4 + \text{N}$ but their effectiveness depend on type of soil, crop and place. Neem based different products have significantly lower $\text{NO}_2\text{-N}$ compared to prilled urea. Neem cake has acidic properties which also inhibit the loss of ammonia volatilization through reducing alkalinity of the soil medium. NCU increased concentration of $\text{NH}_4 + \text{N}$ in soil at all growth intervals as compared to normal urea and it also had lower amount of $\text{NO}_2\text{-N}$ in flood water than prilled urea. NCU also recorded the maximum amount of available nitrogen, phosphorous and potassium (NPK) in soil, it might be due to organic nature and nitrification inhibiting properties and acidic behaviour of neem cake which helped to maintain higher amount of organic carbon and available NPK in soil. Similarly, urea blended with neem seed cake improved the availability of N in soil due to significant reduction in

$\text{NO}_3\text{-N}$ leaching. NCU also maintained prominence due to slowly released nitrogen, which is absorbed and utilized by the plants, thus reduced nitrogen loss. Thus, application of NCU increases the N availability for crop growth and also is helpful in reducing the pollution of water, soil and air.

NCU on pest management

NCU helps to retard the activity and growth of the bacteria responsible for denitrification. It has some properties like anti-feedant, anti fertility and pest growth regulation due to presence of neem oil. It not only helps in plant growth, but also prevents a large number of pests and insects such as caterpillars, beetles, leaf hoppers, borer, mites, etc., responsible for crop damage. It also protects plant roots from nematodes and white ants.

Price and cost on NCU

The cost of coating urea with neem oil is approximately Rs. 40-50/tonne of urea and 0.5 liter neem oil is required for one tonne urea. Cost of neem oil is around Rs.80-100 per liter. The National Fertilizer Ltd adopted this technology at their plant in Panipat (India) and has already started commercial production of NCU. Nimin is a commercially available extract prepared from neem cake, and neem-oil. Hence, either neem cake or neem oil can be used to prepare NCU. The MRP of urea for the farmers has been

kept the same at Rs. 268/- per bag of 50 kg excluding local taxes. Farmers have to pay an additional price of only Rs.14/- per bag of NCU.

Government policy on NCU

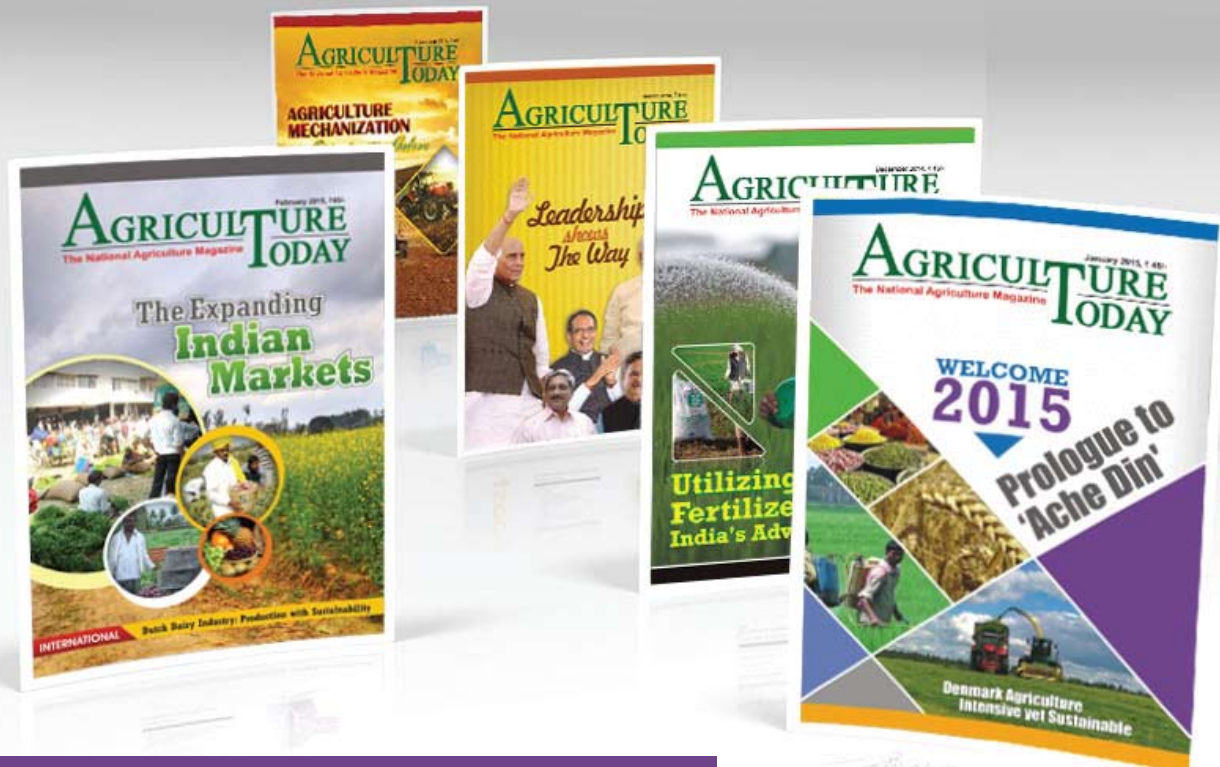
The government is promoting production of NCU in a big way to improve nitrogen-use efficiency. Recently, government had also already decided in January to allow urea producers to produce NCU upto 100% of production and making it mandatory to produce a minimum of 75% of domestic urea as neem coated. Presently, India is importing about 80 lakh metric tonnes of urea out of total demand of 310 lakh metric tonnes. About 20-25 per cent of indigenous urea is neem-coated. On using NCU in place of normal urea, 20% less NCU is required than normal urea thus saving the money. With the use of NCU, import dependency of India for urea is likely to reduce drastically and also government can save nearly Rs. 6000 crores in subsidies annually.

Advantages of NCU

- Neem based urea results in slow release of N during the critical phases of growth
- High soil fertility and increase in yield of crops due to better N utilization
- Reduced urea consumption
- Reduction in environmental pollution
- Controls nematodes, termites, pests and insects.
- Excellent soil conditioner and natural bio-pesticide that helps improve the quality of soil, thereby enhancing the growth of plants and fruits.
- Convenient and easy to apply
- Employment generation in rural areas for collection of neem seeds for manufacturing of NCU
- Opportunity for entrepreneurs to commercialize local neem
- Prevention of illegal diversion of urea to non-agricultural sector.

**B.P.Meena, A.K. Biswas and
A.O. Shirale**

**ICAR– Indian Institute of soil
Science, Bhopal, Madhya Pradesh**




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AGRICULTURE
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India – Belgium: Agriculture Opportunities Galore

Agriculture, a crucial segment in Belgium economy, is spread eloquently in Flanders – the northern part and Wallonia – Southern part. Although known for its Small farms spread across the nation, today the country is witnessing a new trend of bigger agribusinesses. Technologies and scientific intervention is helping increase the quality and quantity of yield. In an interview with Agriculture Today, Mr. Guillaume Choquet, Counsellor Economic Affairs, Embassy of Belgium; Mr. Alexis Bossuyt, Trade and Investment Commissioner, Flanders Investment and Trade and Mr. Christophe Van Overstraeten, First Secretary- Trade and Investment, Wallonia Trade & Investment, Embassy of Belgium discusses the opportunities of cooperation in the agriculture realm that both countries can explore and implement.

How important is agriculture in Belgium?

Agriculture has always been an important sector in Belgium even though it is undergoing some major changes. Both in Flanders – northern part of Belgium- as in Wallonia –Southern part of Belgium, agriculture and related industrial activities are well developed sectors. For the time being, there are two major trends in agriculture in Belgium. The first is the disappearance of the small-size family farms as agriculture in Belgium becomes more and more intensive and efficient. There is a shift from a large number of small size farms to a limited number of farms but of a bigger size. Since the 80s, the number of farms has diminished by 65% in Belgium even though the overall cultivated area remained the same. In Flanders, the cultivated area has increased from 8 hectares on average to 22 hectares and in Wallonia from 21 hectares to more than 51 hectares. Improvement in technical know-how and increase in the use of machineries used in agriculture were and are still two major drivers for this trend. The second major trend is the use of state of the art technologies in this sector and the implementation of scientific researches



**Mr. Guillaume Choquet,
Counsellor Economic Affairs,
Embassy of Belgium**

related to agriculture aiming to increase the quantity and quality of the yield. Organic farming is another emerging trend as more and more farmers are aiming to adopt environment friendly techniques, less hazardous for the health of the consumers. Out of the estimated 40,000 farms in Belgium, 1100 are organic farms. In general Belgian agriculture may be considered competitive and innovative. One of the major constraints being the investments that the farmers need to make to buy machineries and equipment required for cultivation.

What is the contribution of Agriculture in Belgium Foreign Trade?

Agricultural products constitute more than 10 percent of Belgian exports and an additional 5 percent if we include Agribusiness.

What is the major challenge that you see in agriculture in India?

The use and transfer of technology are two elements that may improve agriculture in India. Skills development in the Indian farming sector is also one of the challenges. Nowadays in Belgium, more and more people working in the agro sector are following courses at universities in various agricultural fields like Bio engineering. Universities in Brussels, Flanders and Wallonia have degree courses that focus on agriculture. As the Belgian universities are seeking an increase in exchange programs and cooperation with other universities, it may be an opportunity for Indian universities to collaborate and work with these entities and develop tailor-made programmes with a special focus on Indian farmers. As the Indian farming is mostly dependent on monsoons, it can be also helpful to find crops that need less water and to

promote use of scientific technologies to reduce this dependence on rains.

Post Brexit, what are the changes do you expect in the world order in agricultural trade?

The British government has just started the procedure of Brexit so there is a lot of uncertainty as to what will be negotiated between the United Kingdom and the European Union and its implication. The European Union has the advantage of being a single market. This refers to the EU as one territory where the goods and services do not face the obstacle of internal borders and have the freedom of movement. What will be the relation between the UK and the EU in the future and if the UK will still be part of this single market remains to be seen.

Please brief us about the Joint Economic Commission

India's Joint Commission with the Belgium-Luxembourg Economic Union was established in 1997. It is an important government to government platform to discuss the economic and commercial issues and ties between both sides. Belgium and India share good relations with each other. Belgium is India's second largest trade partner in goods within the member states of the European Union and India is Belgium's second largest export destination outside the EU. Both countries are committed to further strengthening of their trade and economic relations in order to diversify the bilateral trade basket and favor the investment in both countries. The Joint Economic Commission is a dialogue between both parties aiming to foster trade and economic relations. The aim is to not only strengthen businesses and investment opportunities, especially in sectors with mutual interest and complementarity like information & technology, biotechnology, pharmaceutical, railways, health and health care sector and renewable energy but also to find new avenues of bilateral cooperation and increase mutual trade.

Which are the prospective areas that Belgium intends to explore in future with India?

The prospective areas are numerous as Belgium has highly specialized companies which can bring scientific and technical know-how in the sectors of clean tech, renewable energy, food processing, infrastructure much of which are the central themes and focus areas of the present Indian government. One of the main features of Belgian industrial landscape is an important number of small and medium size companies. As a consequence, those companies are keen and able to propose customized solutions.



**Mr. Alexis Bossuyt,
Trade and Investment
Commissioner, Flanders
Investment and Trade**

How do you see India as a market for Belgian products?

Flanders' Agricultural Marketing Board is an organization from Belgium-Flanders striving to promote exports of products and services of the Flemish agriculture, horticulture, fishery and agro-alimentary sector. In 2016, Belgium-Flanders became the largest European exporter of apples to India with a volume of over 10000 tonnes. We think that there is more potential, as India as an emerging market is growing and the consumers are focusing more on healthy foods. The consumption of food products by a growing Indian middle-class offers good market expansion prospects. It should also be noted that apples are widely consumed fruit in India. This is the main reason for our keen interest in exploring this market. We have extra sweet apples with crisp bite, smaller size along with good quality, fully in compliance with Indian food safety standards. Last April, we promoted our products at 'Fresh Produce India' in Mumbai. We notice a fast growing trend in the trade of 'Vegetable products' and 'Food & Drinks'. Comparing the Belgian exports to India of 'Vegetable products' and 'Food & Drinks' (January - November) of 2016 with 2014, the number has more than doubled from ca 4.2 million Euros to ca 9.2 million Euros and from ca 8.5 million Euros to ca 14.5 million Euros respectively. Further diversification of our trade with India is however required.

How can Belgium help India in developing food processing and cold chain technology?

We developed a lot of agro-technology through research and investigation in Belgium. Belgium Luxembourg Business Association (BLBA) promoted India recently as an important destination for Flemish SME's in food processing technology and food logistics. A number of Indian companies and a delegation from Mega Food Park (West Bengal) made a visit to Belgium-Flanders last March. They looked at our cold chain technologies and took the knowledge back to India. There is a huge opportunity in food processing technology in India. 40% of the total food production in India is wasted every year. The main reason is inappropriate supply chain management and lack of basic facilities to store the foods. Processed food products account for 32% of the country's total food market with an average growth rate of 20%. BLBA

has recently released their fact finding report 'Bottlenecks in food processing industry in India: how Flanders can bridge the gaps?'. The Report highlights very advanced technologies in the field of food processing and food freezing, production integration processes, safe and hygienic food packaging and food logistics which can greatly benefit the Indian Food Processing Industries. During the State Visit of Their Majesties the King and The Queen of the Belgians to the Republic of India coming November a High-level Business Seminar will be held on the topic: 'Belgian innovative contributions in shaping India's future as a global food player'. An important number of Belgian CEOs will be present to interact with the Indian business community in order to strengthen business ties and creating partnerships. In 2018, another big Fact-finding Trade Mission is scheduled in the Field of Agrofood and Food Processing to North India.

What are the areas in agriculture other than trade, where India and Belgium can cooperate?

Firstly, there is potential in the framework of the 'Make in India' campaign. Belgian companies can bring their innovative technology to agro-food sector in India. The Indian companies have the land, human capital and financial assets to build the factory. They can do a joint venture for the set-up of the factory and the commercialization/distribution of the added value food products all over the domestic market. It will be a win-win situation for Belgian and Indian companies. Secondly, we see a potential of partnerships through the concept of 'Exchange of Markets'. Following this concept, agrocompanies, wholesalers and distributors distribute each other's products in their respective markets through a joint venture structure.

In addition to apples, what are the other agri commodities that you are exporting or planning to export to India?

Pears are exported in good quantity. Focus should be drawn towards products that are easy to export and

those products which possess long shelf life. Stone fruits might also have potential for the Indian market. We should focus more on products in which we excel worldwide, for example the quality of our potatoes is very good and we are worldwide known for our French fries as well. Potatoes are exported to India in frozen form.

Thirty percent of all frozen vegetable production of EU takes place in Belgium. Whereas frozen processed vegetables have large market potential in India, maintenance of the cold chain all along the process remains an issue.

In India there is also demand for Belgian chocolates and beer. Cheese is also a known product from Belgium in India and we see huge acceptance and demand for it in the future.

Please tell us about agriculture institutions in Flanders

Various important agricultural knowledge centers are based in the Flanders region. The 'Research Institute for Agriculture, Fisheries and Food Research' is providing multi-disciplinary research and specialized services. They want to close the growing gap between agriculture and food in order to have good food products. The 'Flanders Centre of Postharvest Technology' is a collaborative project between the Association of Belgian Fruit and Vegetable Auctions and the Catholic University of Leuven. Their mission is to provide technological advice and extension related to storage technology and quality of fruits and vegetables to producers and co-operatives. We have a good number of universities specialized in agronomy like Catholic University of Leuven, University of Ghent and Thomas More Institute. There are food industry clusters like 'Flanders Food'. 'Flanders Bio' regroups a number of companies and research institutes specialized in life sciences. Partnership building and exchange of expertise & knowhow will strengthen mutual growth and prosperity in both our countries.

Who are your biggest trading partners in agricultural commodity?

Our biggest trading partners are

countries that are from the European Union because of accessibility and limited logistics involved. UK is an important trading partner for agro-food.

Has the volume of trade with UK been affected by the creation of Brexit?

UK is a very important market for the EU but we think the impact of the Brexit on the volume of trade might be tempered since UK is not an agro-food country and is not self-sufficient in agro-food. They do not have enough local production to sustain the needs of the entire population; so they will not limit themselves in cutting the imports from other countries especially from Europe. Secondly, Pound Sterling with respect to the Euro has lowered in value; so our products have become costlier and less competitive than the local produce in the UK. That is one problem that exists; it has not, however, downgraded our export too much with regard to the UK. If a glance is cast on the trade exchanges inside Europe, favorable trade agreements are there with non-EU Member States like Norway. EU has specific trade relations with Norway which is not a part of the EU. These type of countries adapt all the norms of the EU to be able to import export as per the laws of EU because the standards are so well defined. We may perhaps have similar arrangement with UK. Main providers of agriproducts to UK are all European countries. If UK decides to impose import duties then it will apply to all EU countries. The only competitors will be those outside the EU but the problem of logistics will come in to play a crucial role; improper cold chain technologies especially for fruits and vegetables can also pose hurdles. So we think creation of Brexit will not directly impact the trade flows. The only risk you have is the competition from local produce. EU also provides agriculture subsidies to improve technology and fruit processing facilities, etc. Once UK moves definitely out of the EU, it will stop receiving these subsidies. We do not think this situation will shift the priority of UK to suddenly undertake massive investment to become self-sufficient in agriculture.

What are the challenges in the agricultural trade with India?

Our two countries have a history of close ties both politically and economically. In terms of the Agro food Sector, a major impediment is still the lack of a Free Trade Agreement. Though new opportunities arise, the phytosanitary regulations, product sampling, registration, labelling norms etc. add up to the complications. Improved trade exchanges and more free movement of goods could make a significant difference and provide for a better common grounds of trade, in particular for Agro food products.

What are the areas in agriculture, where Belgian companies are active in India?

In the Agro food sector, Belgian companies are not only engaged in food products but also with technologies and equipment. Technologies for the dairy sector and fertilizers are two areas in which our companies are active in India. These technologies help improve the quality of milk across the collection and processing chain, whereas in the fertilizer industry our companies supply both chemical and organic fertilizers, contributing towards increased productivity of farms in India. In the dairy sector, we are in the process of bringing together some companies from India and Wallonia (the Southern, French-speaking region of Belgium) to explore new options such as the production of paneer. Since the paneer production process has similarities with the cheese making process, there seem to be potential synergies that could be exploited.

Please tell us about important agriculture institutions of Wallonia

The region of Wallonia – just like the region of Flanders in Belgium – boasts a very modern and well developed agricultural sector. In Wallonia, the local authorities have developed six competitive economic clusters that bring together companies, research centres and universities in a spirit of collaboration and innovation. One of



Mr. Christophe Van Overstraeten, First Secretary-Trade and Investment, Wallonia Trade & Investment, Embassy of Belgium

these clusters is called WagrALIM and represents the Agro food sector. In addition, the University of Gembloux in Wallonia specializes in agronomy and bio-engineering, among others, and is an example of the broad know-how of the region in these fields. Another example in Wallonia is the Centre for Agronomy and Agro-industry of the Hainaut Province (CARAH), a research centre on potatoes specializing in technologies to avoid diseases in potatoes. They have for example worked on a technique to fight mildew in the potato industry. Research in the Agro food sector focuses on offering outstanding quality and healthy products and bringing more competitive and value-added products to the global market. The Agro food sector is also an area where increased collaboration between Indian and Belgian universities, companies and research centres could be looked at.

How favorable is the business environment for Indian companies investing in Belgium?

In terms of trade, Belgium is currently the second trading partner of India within the European Union, after Germany. Trade interactions between our countries are evident in the large

number of companies that have set up businesses in the other country. To date, some 160 Belgian companies have established business interests in India and about 80 Indian companies in Belgium, for example in sectors with mutual complementarities like industrial equipment, ports, railways, renewable energy, pharmaceuticals, biotechnology, information technology, healthcare, and aerospace. Belgium presents a natural geographical edge. It is located in the middle of Western Europe's main markets with easy and fast access to all neighboring countries. This means that our country is a perfect hub or gateway to the rest of the European Union. In addition, Belgium provides a number of attractive fiscal and other incentives to make life easier for foreign companies. In terms of logistics, the country is well connected in every means of transport. We have developed an excellent transportation infrastructure of ports, canals, railways, and highways to integrate our local industry with that of our neighbors. In addition, our ports and airports are specialized and well-equipped with high quality facilities for the distribution of fruits and vegetables all over Europe. We also provide excellent warehousing infrastructure and expertise to suit the precise needs of every Agro food company.

How does the Government of Belgium support agriculture producers who cater to global trade?

The Government is absolutely supportive of the Agro food sector. We do that for instance through export promotion agencies. We have specific subsidies, for instance, to support Belgian companies who want to explore international markets to develop their business there. If companies from Belgium want to come to India to meet trade partners or attend trade shows there are specific aids offered to them in order to support their travel costs. Similar support is provided in terms of gathering information for our companies or identifying potentially interesting partners.



ICFA Working Group on ICT in Agriculture launched

Prof MS Swaminathan, Father of Indian Green Revolution, launched the ICFA Working Group on ICT in Agriculture at ICT CEOs Conclave on the subject at New Delhi. India is an IT superpower but ironically, the tremendous progress made by the IT sector has largely bypassed the domain of agriculture in India during the last three decades. There is a huge potential for application of Information and Communication Technology in Agriculture to enhance the efficiency of farming operations, monitoring of diseases and pests, price discovery, farm advisories, resource management and market connectivity, which can expeditiously escalate farm profitability. Speaking at the occasion, Prof Swaminathan said that for evergreen revolution, technological empowerment is necessary with special emphasis on pro-nature, pro-poor and pro-women interventions. He affirmed that this ICFA working group would provide a platform for ICT enabled services and solutions to empower farmers optimise their incomes. Dr M Moni, former DG- NIC, who chairs this working group spelt out the detailed road map for rural digitization and extending benefits of ICT to farming community. Dr. Anand Bhaskar Rapolu, Hon'ble Member of Parliament underlined the urgent need to provide fast and timely solutions to farmers and farm based problems which can only be possible by integrating ICT in all farm services, policy support and technology interventions. He stressed on the need to analyse the gap between schemes and their implementation. Dr Ashok Dalwai, Additional Secretary, Ministry of Agriculture & Farmers Welfare who chaired the conclave felt, that the extension system of the country needs to be revamped with ICT and private sector needs to supplement the same. He also underlined the importance of post-production activities for doubling of farmers' income and the role ICT can play. He hoped that ICFA Working group would bridge this critical service gap. Dr MJ Khan, Chairman ICFA emphasized that this working group will be a holistic alliance of policymakers, agricultural scientists, extension specialists, industry and progressive farmers to address the magnitude of challenges and facilitate a comprehensive growth of ICT in agriculture. It mandates to act as a coordinator across stakeholders for a meaningful and impactful intervention. The forum will follow up on important recommendations with concerned national and international agencies; facilitate farmer's sensitization; promote ICT applications for farmers' empowerment and international collaborations.



ICFA launches Working Group on Uttar Pradesh

ICFA launched a 50 Member Working Group on Uttar Pradesh at the concurrently organised National Round Table on Agriculture on 22 July at Lucknow in the presence of Dr HK Bhanwala, Chairman, NABARD. Sh. Rajneesh Gupta, Pr. Secretary - Agriculture and Dr. PK Joshi, South Asia Director, IFPRI were the Guests of Honour. The meet was attended by senior officials, industry CEOs, experts, farm and business leaders.



ICFA visits Chandigarh

Dr MJ Khan, Chairman ICFA along with senior Directors visited Chandigarh and met Prof. KS Solanki, Governor of Haryana and presented him report on Eco-Agriculture. The Governor agreed to join Agriculture Leadership Summit on 5th Sept in New Delhi. The Chairman also met the Chief Principal Secretary to CM Punjab, Mr. Suresh Kumar and discussed about ICFA and Punjab Government partnering on sustainable agriculture initiatives. The chairman later met Agriculture Minister Haryana, Sh OP Dhankhar over dinner at his house. During the visit to Chandigarh wide range of issues and the policy thrust required towards empowering farmers were discussed. The CM asked ICFA to help in branding of Haryana farm produce and in creating market linkages. He agreed for launching District Agriculture Councils in Haryana starting with Karnal and also consented to join ICFA Agriculture Leadership Summit on Sept 5 at New Delhi. While on way to Chandigarh ICFA team visited an ICAR awarded Dalbir Hightech Horticulture Nursery Farm at Shahabad, Haryana



ICFA initiates District Agriculture Councils

Looking at the importance of grassroots participation in policy planning and programs implementation, ICFA has initiated on the creation of the powerful institution of District Agriculture Councils to connect all key stakeholders for district vision, agenda setting, policy advocacy and facilitating trade, technologies, investments, agribusinesses and resources mobilisation for holistic development of the district agriculture and farmers empowerment. First District Agriculture Council was launched in Lakhimpur (UP) on 21 July 2017.



Farmer Fair Price and MRPs for Farm Produces: New Way Forward?



Management of prices of agricultural produce securing the interests of the producers and the consumers has been through age old, limited strategic options of support prices by way of MSP for important staple crops, tweaking import/export policies and the rest left to “market forces” to determine the fate of the farmers and the consumers. MSP has in more than one occasion proved inadequate to prop up prices and other policy initiatives which are reactive rather than being proactive. Therefore, the system does not offer any safety net for non-MSP crops, and farmers are forced to take to the streets when pushed to the wall,

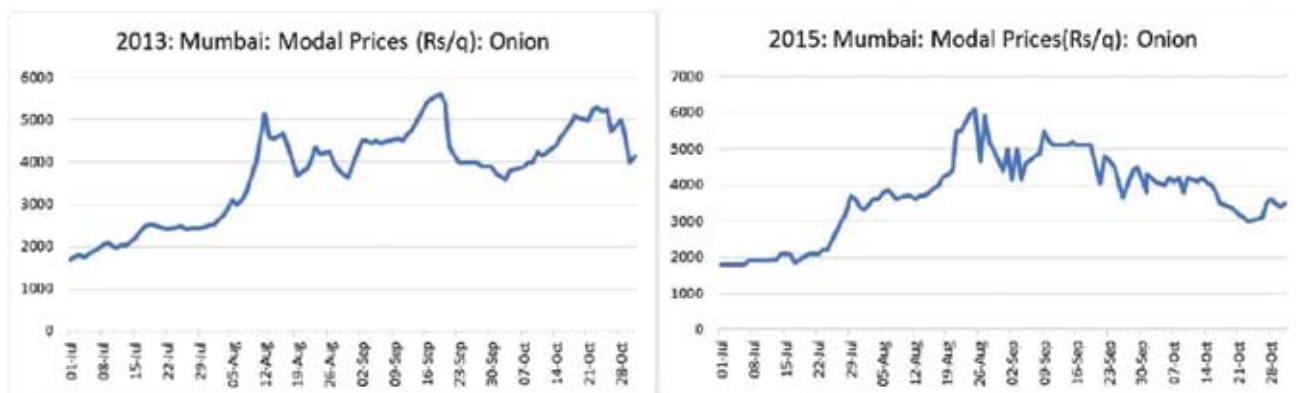
which is of no avail in finding a lasting solution barring some temporary solutions which may benefit some of them.

Absence of Price Safety Net

Farmers across the country decide on the crop to be taken up for every planting window with hopes of realizing certain incomes based on the past season prices. Overwhelming convergence on certain crop choice as a result of the decision by millions of farmers, in combination with a favourable growing condition inevitably results in slump in prices, just as it was recently seen in onion. It is not unusual to hear of farmers ploughing down their crop ready for harvest since the market prices

cannot pay back even the incremental costs of harvest and transport. This is often seen in many vegetable crops mainly tomatoes, and to some extent in onions and potato, when market prices fall below cost of production. Ironically, it is also not uncommon for the situation changing drastically within a few weeks, with the prices soaring high in the consuming cities/town. When the prices rally, does the income of the farmers always go up to make up for the losses? Yes, it is possible if the farmer had one more delayed planting done, he may well hope to benefit or some other farmer who had a delayed planting. When there is a gain, the system would convey a part of the gain to the farmer, whereas losses in a falling

	2011	2012	2013	2014	2015	2016
Avg Monthly Arrival MTs	23,401	21,786	19,337	22,244	24,760	23,939
WtAvg Modal (Rs/Qtl)	1,277	863	2,518	1,695	2,770	1,028



market is entirely to the farmer since the traders would protect themselves from further drop by the time they hit their markets.

There has to be an alternative to MSP to offer a price safety net to the farmers, besides price forecast and planting advisory to warn of potential excessive production. Every manufacturer has a right to earn a reasonable return for their efforts and it cannot be based on a gamble. Farmers are the lone category of producers with no certainty of a minimum price realization and absolutely no say on their selling price of their goods.

Gains from Price Crash

An analysis of the onion arrivals in Mumbai market for the period 2011-2016, shows that the average monthly arrival over the six year period was about 22,500 MTs.

Weighted average monthly modal price in the year 2012 was the lowest in the six year period at Rs.863 per quintal, when the average monthly arrival was 21,786 MTs in Mumbai. At such low prices in 2012, average monthly arrival during the year was actually lower than the six year average monthly arrival. This substantiates that lower prices does not lead to higher consumption. Therefore, price crashes attributed to "higher production" is unlikely to have any significant increase in demand, but, such price crashes inflict financial losses to the farmers in the name of free market operations. The situation, however, offers an opportunity to stock up by people with risk appetite

or speculators with hope to profiteer a few weeks later when stability returns. The situation needs a system correction to prevent panic selling by farmers and preventing transactions being carried out less than a certain minimum price. A mechanism for farmers to have a say on the prices and stay united in eliminating the situation should be developed as such a situation exists in no other industry where the manufacturer has no say on prices of their goods.

Wholesale Price Volatility

In August-October 2013, when modal price averaged at Rs. 4,291 per quintal, monthly arrival averaged 14,316 Mts, a significant drop of about 36% over the six year monthly average arrival. At such price levels, needless to mention that essential items like onion was getting out of reach of lower income household.

As may be seen from the above graph for the period in 2013 Modal prices doubled from Rs.2,525/ql on 1st August 2013 to Rs.5,150 on 12th August 2013 causing panic amongst the consumers. Inter day prices changed in excess of 10% on 8 occasions including 3 of which were in excess of 20% over a three month period. Similar spike was observed in 2015 around the same period of the year, when modal prices nearly tripled from Rs.2200/ql on 24th July 2015 to Rs.6000/ql on 25th August 2015, in about a month. Certain sections of the trade with speculative interests could use lack of price controls in the system that is said to operate on free market principles of supply and

demand. Price controls referred is not Government advocated prices, but the norms and system for determining auction price bands in whole sale markets, which all participants are in a position to know at least a day prior to trading day. Norms among other aspects could include safeguards to check undue profiteering at any point in time. Such systems could prevent sharp spikes and drops as pointed out earlier, control or knowledge of which is possibly privy to some limited parties. Even the stock exchanges have price bands and beyond which it is not relaxed in order to avoid market crashes and surges driven by not so very fundamental reasons. Even Indian financial markets are so well regulated, markets dealing in consumer daily needs of consumers should be better regulated and discourage speculative tendencies.

A Need Statement

In summary, present situation is that farmers are made to play blind gamble game in the name of free market. Farmer has no control over the prices for his goods, have to be content with whatever is received from the market and the consumer has no assurance of a price ceiling, has to accept prices demanded by the market. Every manufacturer is required by law to print the Maximum Retail Price of the product with the exception of the agricultural commodities. Various reports on share of consumer rupee that goes to the farmer point to an unfair share accruing to the farmer, however, there has never been an attempt

to correct the equation through a system that is not dependent on the Government.

In the normal course, the trade operations are conducted in a reasonably fair manner with exception of some speculative interests that seek high returns for their idle money, and such interests have to be kept away from agricultural spot markets.

Intervention 1: Determine Fair Farmer Price

It is imperative to develop a mechanism that allows them to determine a fair price for all non MSP items, just as any manufacturer has a cost plus model which is subsequently tested in the market, based on cost of production and reasonable return at the beginning of every harvest season based on the productivity expected during the season. Such Farmer Fair Price (FFP) for a FAQ grade with premium for better grades could form the minimum price at which the markets would operate. With this kind of a price safety net in operation, even when production increases by about 20% over normal, just as is the recent past in onion, farmers would show necessary resilience and refrain from flocking the market in desperation to sell their goods adding to selling pressures eroding prices by 50%. Unlike in MSP operation, FFP system does not put pressure on the Government to carry out price intervention procurements. In such situations of excess production, as farmers are assured of FFP, they would be motivated to grade and bring better material to the market to earn better. FFP mechanism of working could be led by the Marketing Boards and designed in consultations with the farmer bodies, trade bodies, thinkers and researchers on agricultural markets. Such an arrangement of price safety net for the farmers would ensure their income per acre of crop, also learning that they may need to be contend with some part of their production remaining unsold if in excess of demand. This is a better option than getting paid pittance

and hitting the streets in desperation when production surges.

Intervention 2: Determine Price Band in Consumption Markets

At the consumer end, a similar model of FFP cost plus reasonable returns based price bands should be developed for each market. By limiting the auction price band (APB) within a certain range, traders would be encouraged to source from alternate markets to feed the demand when in short supply rather than look for higher margins from limited quantity. All vegetables follow a certain pattern of flow which is largely the same every year based on the harvest seasons in different states. Trades happen across states often goods clocking long distances and therefore landed costs would vary based on the transportation cost involved, not considered a significant portion of the total cost and hence would fit within the reasonable price band determined for each market. There would be many other factors that would be required to be considered in designing a system for determining APB and operating guidelines formulated.

In the case of Onion, exports are regulated through minimum export price (MEP) which was removed in December 2015, such measures could be done away with from point of view of regulating market prices as the proposed FFP would address the farmer interest, and APB at the consuming markets for the consumers. However, MEP regulation if needed for controls from a forex transaction angle is not discussed herein. If necessary to announce a MEP, it could be based on FFP plus cost model.

As the farmer is assured of a fair price, they would be better placed to handle market pressures exerted on them based on market rumours. Fixing auction price bands in consumption markets would assure the consumer that the price being paid has a reference to what the farmer receives and is not being exploited by some unknown forces. By pegging both ends of the supply chain, the scope

for abnormal profiteering is restricted which would help restrain speculative interests preventing sharp spikes, without having to undertake futile exercises of stock verifications to prevent hoarding.

Other supporting initiatives would be to strengthen market forecast mechanisms. Market intelligence techniques over the recent past few years have developed capability to forecast price trends for the future. Aided by satellite imagery services, it is possible to track crop coverage and its progress leading to crop estimates on a real time basis including harvest schedules and likely market arrival. These efforts could be more rigorous, continuous and institutionalized as part of either the Agricultural Marketing department or the state marketing boards, to provide planting advisory to avoid excess or short acreage. As Farmer Producer Organisations (FPO) are striking roots in the country on a wide scale, these institutions could be supported to build capacities to manage marketing of produce helping farmers to consolidate and demand being paid in reference to FFP.

An implementation mechanism under the marketing boards of each state could form an empowered consultative body which can recommend FFP for all such commodities other than those covered under MSP but of daily consumption significance could be covered. Similarly, for all consuming markets in various cities/town could base their permissible auction price bands linked to the FFPs for their supplying centres. The mechanism and operations of this scheme of FFP and APB could be piloted for major vegetable crops to begin with.

It is now time to knock out some of the old processes which have turned vestigial and to indulge in some more fresh initiatives in securing farmer interest alongside getting APMC markets to compete for existence.

Ravishankar Natarajan
Agribusiness Specialist, former CEO,
Safal National Exchange

AGRI DATA OWNERSHIP

DO FARMERS OWN THE DATA GENERATED ON FARM?

With the advent of precision agriculture, there is a lot of data created on farm.

By logic or by law, farmer should own the data generated on the farm. To avail the services of other stakeholders like machinery provider, input suppliers, precision equipment suppliers and others, farmer has to supply (or upload) data in digital form.

Is there any data ownership which can be claimed by the farmer once the data is shared to third party (other stakeholders)?

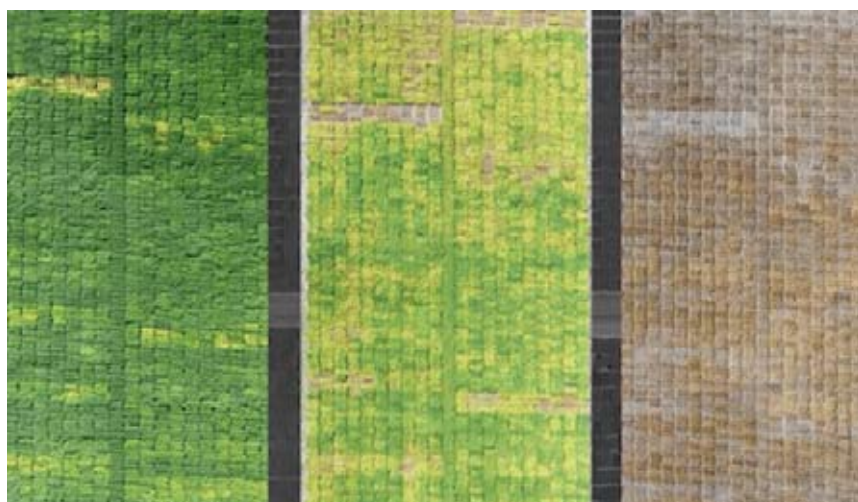
Agri data is neither recognised under traditional type of property (land, building, good and animals) nor any traditional intellectual property (patent, trademark and copyright). Now, there are two situations left:

1. Trade Secret

Trade secret is some specific information available with the farmer which can't be easily identified by another person and have some economic value. According to the legal definition of trade secret, Information, including a formula, pattern, compilation, program, device, method, technique, or process, that: (i) derives independent economic value, actual or potential, from not being generally known to, and not being readily ascertainable by proper means by, other persons who can obtain economic value from its disclosure or use, and (ii) is the subject of efforts that are reasonable under the circumstances to maintain its secrecy.

2. State law

For protecting agri data, government



can enact law to prohibit the copying and distribution of data without farmer's consent. Maintaining and proving Agri Data as a Trade Secret is a very complicated and cumbersome process. There are no such Agri Data specific state laws as it is a very new topic in the legal fraternity. So the only fool-proof solution left in the case of agri data is, "individual contract agreements to treat agri data as a protected trade secret".

Contract Agreement must include 10 points discussed below.

- **Consent:** Collection, access and use of farm data should include consent of the farmer with proper signed (or digital) agreement.
- **Notification:** Farmers must be notified for the collected data with proper details about its usage.
- **Complaint Redressal:** Proper complaint redressal mechanism with full transparency.
- **Features:** Defining the availability of services and features when the farmer make choices for opt-in and

opt-out.

- **Portability:** Data portability and data retrieval for storage and usage in other systems.
- **Confidentiality:** A clause for not sharing or disclosing the farm data with a third party in any matter that is inconsistent with the contract agreement.
- **Retrieval:** Farmer should have the authority to discontinue the services and collection of data. Services discontinuation should be supported with an option of retrieval and secured destruction of collected data.
- **Misuse Protection:** Prohibition of data for anti-competitive activities like speculation in commodity markets based on inputs from the farm data.
- **Safeguards:** Clearly define liability and security safeguards for loss or unauthorized access, destruction, use, modification and disclosure.
- **Policy:** Notice and response policy for agreement breach.

Amit Kalkal
Director, Agri Innovation

SHATAVARI

A RICH HERB FOR CATTLE FEED

India is the largest producer of milk followed by USA and China. However, the country lags behind in milk productivity and in milk quality due to poor pre-and post-partum nutritional management and low energy status of dairy cattle. Another existing problem is that most of the farmers in our country care for lactating animals, neglecting the pre-partum health. Nutritional management is starters to enhance the milk productivity, quality and health status of dairy cattle. Shatavari is galactogogues in ayurveda and found that its roots and root extracts can improve lactational inadequacy in lactating mothers viz., guinea pigs, goats, buffaloes, cows and humans. Shatavari possesses many qualities and is one of the ingredients of modern formulations which are advocated for the pregnant women. The plant is also found safe during pregnancy and lactation. Large scale cultivation is very essential to meet the demand of this crop. The accessions maintained at ICAR-DMAPR, Gujarat namely DAR-7, DAR-2, DAR-6 and DAR-37 are suitable for large scale cultivation and ideal for small and marginal farmers for livelihood security.

Asparagus racemosus Wild

belonging to family Asparagaceae is a common medicinal plant throughout India. The name *Shatawari* means “curer of a hundred diseases” (shat: “hundred”; vari: “curer”), therefore, “Shatavari” is one of the well-known drugs in Ayurveda, effective in treating madhurrasam, madhurvipakam, seetveeryam, somrogam, chronic fever and internal heat. The herb is highly effective in problems related with female reproductive system. It grows well and prefers to take root in gravelly, rocky soils high up in piedmont plains, at 1,300–1,400 m elevation which is found mainly in forests throughout India. The plant prefers annual average rainfall of 600–1000 mm or less, of which 85% is received during July to September. A well-drained fertile sandy-loam to clay-loam soil, with a pH of 6–8 is best suited for its cultivation with staking support. Shatavari can be grown in open land as well as under shade, but very high moisture levels result in rotting of root. Both seeds and crown rhizomes can be used for propagation. Seeds may be collected from March to May when their colour changes from red to black. Vegetative propagation is by division of rhizomatous disc present at the base of the aerial stem. The rhizomatous

disc develops several vegetative buds around the aerial shoots. The disc is divided in such a way that each piece carries at least two buds along with 2–3 tuberous roots. These pieces are planted covering the buds with 1 cm of soil followed by irrigation. The sprouting commences in 8–10 days after earthing. Shatavari is normally grown as a monocrop, but it can be grown in inter spaces available in orchards having low light interception. Plants need staking material, thus poles or shrubs serve for support. About 10 tonnes of well-decomposed FYM is thoroughly mixed in the soil one month before transplanting. Shatavari further requires a fertilizer dose of 60 kg Nitrogen, 40 kg Phosphate, and 40 kg Potash per hectare for optimum growth and higher tuberous root yield. One-third of Nitrogen and entire dose of Phosphate and Potash should be placed 10–12 cm deep in the rows before transplanting. It can be grown without irrigation in areas that receive 800–1200 mm of well-distributed rainfall. Irrigating the field once immediately after transplanting is a must for establishment of seedlings in field. The second irrigation is done after seven days of seedling establishment. If there is no rainfall



Root morphology of asparagus accessions



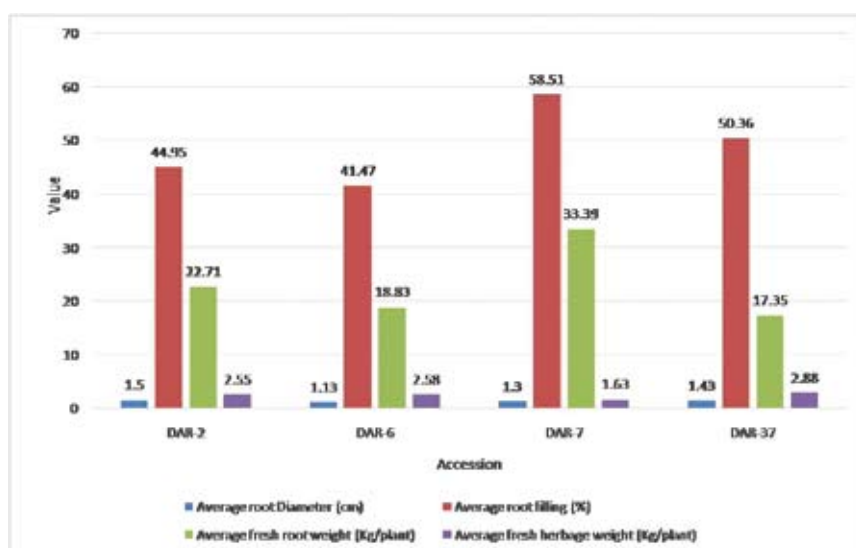
Field view and root harvesting

and dry spell prevail for more than 15 days, one more irrigation should be given. During winters, irrigation at 30-day intervals is enough for good growth. Irrigation should be done during seed formation stage and before harvesting of the tuberous roots for obtaining higher seed yield and easy harvesting. Deficient soil moisture during March–June brings down root yield significantly. The crop matures in 12 months after planting; however, for seed harvesting, it is recommended to be harvested only after 18-20 months. Rabi season, i.e., November–December, is the best time for harvesting tuberous roots when the above-ground parts start turning pale yellow. The crop, when harvested in 12 months, yields about 4-5 tonnes/hectare, while harvesting after 20 months, yields about 6 tonnes/hectare of tubers along with 35 kg/hectare of seeds, which are not obtained in the 12-month-old crop. The calculated yield of 20-month-old crop of Shatavar is 3 tonnes/hectare, which can fetch net returns of approximately Rs. 62,500/hectare.

Due to galactagogue, aphrodisiac, anodyne, and diuretic properties or its multiple uses, the demand for *Asparagus* is constantly on the rise. Various pharmacological studies have revealed the ability of asparagus extracts to modulate the immune system and its application in treating neurological disorders, diarrhoea, and dyspepsia. Steroidal saponins such as shatavarins, isoflavones and alkaloid Asparagamine-A have been constituents of its roots.

Galactagogues Properties:

Use of shatavari in augmenting the animal productivity as a whole is very limited in stall fed animals managed in organized farms and by progressive dairy farmers. This fact is important as growth and milk production of stall fed animals, which contribute significantly in sustaining the higher productivity, could be improved. Cultivation of shatavari can be useful for the small and medium dairy farmers and cultivators in state like Gujarat, Rajasthan, M.P., U.P., Haryana, Maharashtra and Punjab etc., which



Root yield and contributing characters of potential accessions

contribute significantly in total milk production. Significant increase in milk yield has been observed along with increased growth of the mammary glands, alveolar tissues and acini. The major active constituents of *Asparagus racemosus* are steroidal saponins (Shatavarins I-IV). Shatavari is one of the ingredients of modern formulations which are advocated for the pregnant women. The plant is found safe during pregnancy and lactation. There are some minerals found in roots viz., zinc (53.15 microgram per gram), manganese (19.98 microgram per gram), copper (5.29 microgram per gram), cobalt (22.00 microgram per gram) along with calcium, magnesium, potassium and selenium.

Animal Husbandry sector is the key economic activity in rural sector in India, specifically in Gujarat. The sector has wide horizontal and vertical dimensions. It contributes to about 30% of agricultural output in terms of value. The dairy is the most important farm enterprise in India. Milk producing farmers face some of the problems which need to be resolved for higher milk production, better income opportunity, support to the farmer and livelihood security. Feeding plays pivotal role in realizing the genetic potential of milk animals. It is also considered critical in the overall success of dairy development

programme as feeding alone contributes more than 70 per cent of the total cost of milk production. Pre-partum supplementation with *A. racemosus* caused extra cost per day per animal but increased fat corrected milk yields per day (4%) was reported. Total income return was higher day/cow up to 150 days of lactation.

Diversity has been recorded on the basis of morphological character of *A. racemosus* in different accession. The 52 accessions were collected from different agro-ecological area which varied in different characters like, stem, branches, root weight, root thickness, root length, root filling and root morphology. Highest average fresh root weight (33.39 kg/plant) and average fill root length (58.51%) was found in DAR-7 and followed by DAR-2, DAR-6 and DAR-37. So, these accessions are more beneficial for getting higher yield and quality milk production. The root extract of *A. racemosus* is prescribed to increase milk secretion during lactation, therefore, the accessions DAR-7, DAR-2, DAR-6 and DAR-37 are ideal choices to the small and marginal farmers.

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BENEFITS OF BANANA BLOSSOM

Banana is the common name for herbaceous plants of the genus *Musa* and for the fruit they produce. It is one of the oldest cultivated plants. The banana (*Musa paradisiaca*) grows best in a humid tropical environment with an optimum temperature of 27°C during the day and minimum temperature should not fall below 13°C. India is the world's largest producer of banana with 13.90 million tonnes followed by Uganda (10.14 million tonnes). Within the country, banana ranks first in the production and third in area (after mango and citrus fruits) among the fruit crops. Occupying about 13% of the total area under fruits in India, banana is grown almost in every state. Among the states, area under banana is the highest in Tamil Nadu (92,200 hectares) followed by Maharashtra (72,200 hectares). Productivity of banana is the highest in Maharashtra at 60 metric tonnes per hectare followed by Tamil Nadu at 52.70 metric tonnes per hectare. All India average is 34.30 metric tonnes per hectare.

Non-availability of adequate nutritious food for the fast growing population is a challenging problem. Development of processed products such as instant products and mix adds convenience, saves time and labour, and provide hygienic products of standard and uniform quality with enhanced shelf-life. Despite the valuable economic and medicinal importance and easy availability of banana blossoms, they are seldom included in the Indian diet.

The banana blossom is a large, dark purple-red blossom that remains at the end of a bunch of bananas.



The 100g of banana blossom, contains 51 kcal of energy, 1.6g of Protein, 0.6g of Fat, 9.9g Carbohydrate, 5.7g of Fiber, 56mg of Calcium, 73.3mg of phosphorous, 56.4mg of Iron, 13mg of Copper, 553.3 mg of Potassium, 48.7mg of Magnesium, 34mg of Vitamin-E and it also contains 137mg of flavonoids especially quercetin

Its sizable bracts, or leaves, snugly enclose delicate, sweetly scented male blossoms. The female blossoms, which do not require fertilization to become fruit, grow farther up the stem from the male blossoms. These florets need to be cleaned well before they are cooked as a vegetable. The banana blossom is rich in vitamins, flavonoids and proteins. The flower has been used in traditional medicine for treatment of bronchitis, constipation and ulcer problems. It eases menstrual bleeding. The extracts of banana blossom have antioxidant properties that prevent free radicals and control cell and tissue damage. They are often consumed as a vegetable in many Asian countries such as India, Malaysia, Indonesia and the Philippines.

Nutrition

Banana blossom has tremendous nutritional value and were consumed as food additive in many Asian countries such as Sri Lanka, Indonesia and Thailand. In Sri Lanka, it is consumed as a curry as well as a boiled or deep fried salad with rice and Wheat bread. Besides being consumed fresh, banana blossom can also be made into various products such as dehydrated vegetable, pickle and canned food. The banana blossom has excellent nutritive value. 100g of banana blossom, contains 51 kcal of energy, 1.6g of Protein, 0.6g of Fat, 9.9g Carbohydrate, 5.7g of Fiber, 56mg of Calcium, 73.3mg of phosphorous, 56.4mg of Iron, 13mg of Copper, 553.3 mg of Potassium, 48.7mg of Magnesium, 34mg of Vitamin-E and it also contains 137mg of flavonoids especially quercetin. The banana blossoms are good source of minerals such as magnesium, iron and

copper. It contains high quality protein because of its well balanced essential amino acid in addition to high dietary fibre and flavonoid concentrations.

Benefits For Human Health

Banana flowers, similarly to bananas are an excellent source of potassium, and also vitamins A, C and E. Banana flowers have tremendous nutritional value. They are a good source of fibre and protein. The flowers contain a class of phytochemicals known as saponins. Saponins lower bad cholesterol, boost our immunity against infection and are thought to inhibit the growth of cancer cells. They also have antioxidant activity and so can reduce our risk to chronic diseases such as cardiovascular disease. Banana flowers are also an excellent source of flavonoids. These phytochemicals are found in many plant based foods and they help prevent damage to DNA cells by neutralizing free radicals. They also help lower cholesterol and are anti-inflammatory, anticancerous and antiaging. The major physiological function of vitamin E is its antioxidant activity. Vitamin E protects the fatty acids by interfering with the free radical reactions that can result in cellular damage and is protective against approximately 80 diseases. Quercetin is a major representative of the flavones subclass and has received considerable attention. Quercetin and its sugar bound or glycosylated, forms represent 60-75% of flavonoids intake. Quercetin has displayed the ability to prevent the oxidation of low Density lipoproteins (LDL) by scavenging free radicals and chelating transition metal ions. Plantain blossom generally helps to cure stomach ulcers and is also useful in treating throat ulcers. It can cure inflammation of eyes and eye afflictions. It can also help in treating vata diseases and nervous debilities.

Banana flowers contain a compound called ethanol, which has known anti-microbial properties and has been used by native people to help treat problems like wound or skin infections for hundreds of years. Ethanol can help to kill bacteria, but it is also effective in reducing the



risk of contracting parasite-borne illnesses like malaria. These flowers are rich in vitamin C and compounds like tannins and flavonoids, which are all known to have antioxidant properties. Antioxidants are important for the body's health because they reduce stress on cells throughout the body and can help to slow down the aging process. And chronic diseases including cardiovascular disease.

Banana blossoms are considered as "Good package of Antioxidants" due to their availability of vitamin-E

and flavanoids. As banana blossom contains high amounts of antioxidants and quercetin, it can be supplemented among the community. It is recommended that analysis of banana blossom from different regions of the state can be carried out to get a range of anti-oxidant and quercetin levels. The future nutritionists should consider a special effort in inculcating the banana blossom into routine diet and to create awareness and share knowledge to the community at large. Hence the food industry should focus on the incorporation of banana blossom into ready to eat products. Being nutritious and of low cost, it can be used to combat malnutrition. Biscuits are sometimes used as a vehicle for incorporation of different nutritionally rich ingredients. Addition of fiber to biscuits products increases dietary fiber intake and decreases the caloric density of baked goods. Banana blossoms can transform into good sources of fiber in biscuits.

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REDUCING FOOD WASTE VITAL FOR INDIA'S FOOD SECURITY



Agriculture, along with its allied sectors, is the largest source of livelihood in India. About 82 per cent of the country's farmers are small and marginal, having holdings less than one hectare. Over the years, irrigation potential has increased largely due to increased access to precious groundwater. However, 60 per cent of our agricultural land is still primarily rain-fed.

A challenge for the Indian agricultural sector today is to feed its ever-growing population, even though India's food grain production has kept steady pace with its population. Total foodgrain production during 2015-16 was estimated at 252.23 million tonnes, five times higher compared to 50



To address the problem of food loss and waste globally, the Sustainable Development Goal 12.3 aims to halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses Credit: US Department of Agriculture/Flickr



million tonnes in 1950-51.

However, adequate food production is not sufficient to ensure food security. Not all food produced is consumed, as an enormous amount of food is lost or wasted. A 2011 Food and Agriculture Organization (FAO) report puts this figure at one third of the food produced in the world for human consumption every year, which is approximately 1.3 billion tonnes.

It is estimated that saving one-fourth of the food currently lost or wasted globally would be enough to feed 870 million hungry people in the world, of which the highest number (about 194.6 million) are in India. Maximum food loss happens during transit from farm to fork, especially to urban markets. These losses not only impact producers with reduced income and consumers with increased costs, but also challenge overall food security.

It has been also observed that food waste and loss occurs differently in developing and developed countries. In developing countries, food waste and loss occurs at early stages of the food value chain. This can be associated with lack of support to farmers, poor/non-scientific harvesting techniques, weak infrastructure, storage, cooling and transport facilities. In developed countries, food waste and loss occurs largely at retail and consumer stages.

“It is estimated that saving one-fourth of the food currently lost or wasted globally would be enough to feed 870 million hungry people in the world”

A study undertaken by the Indian Council of Agricultural Research (2013) highlights that the underlying cause of post-harvest loss in the country is due to the lack of infrastructure for short-term storage, particularly at the farm level, as well as the lack of intermediate processing in the production catchments. The study estimated that an annual value of harvest and post-harvest losses of major agricultural produces at the national level was to the order of Rs 92,651 crore, calculated using production data of 2012-13 at 2014 wholesale prices.

To address the problem of food loss and waste globally, the Sustainable Development Goal (SDG) 12.3 aims to halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses.

To achieve the SDG target

indicator, a number of steps are being taken globally by FAO and associated organisations. FAO is working on the Global Food Loss Index, which aims to account for losses occurring on-farm, during transportation, storage and processing. Accurate measurement of food loss will to create awareness and provide impetus for policy steps and actions to counter the difference.

Another step taken by FAO and Messe Düsseldorf is to collaborate with other partners and donors to develop and implement programmes on food loss and waste reduction. This initiative uses a designed case study methodology to collect primary and empirical data on the causes of food loss in developing countries in selected food supply chains.

In India, this methodology developed by the agro-food industry group of the FAO nutrition and food system division was used for case studies on the food supply chains of rice, chickpea, milk and mango in Andhra Pradesh.

The study indicated a need for capacity building at different levels of value chain actors. It also called for investment in large storage facilities and other related infrastructure such as roads and electricity to ensure reduction in food loss and waste. This can eventually lead to enhanced food security in the country as well as globally.

Shyam Khadka,
FAO Chief for India

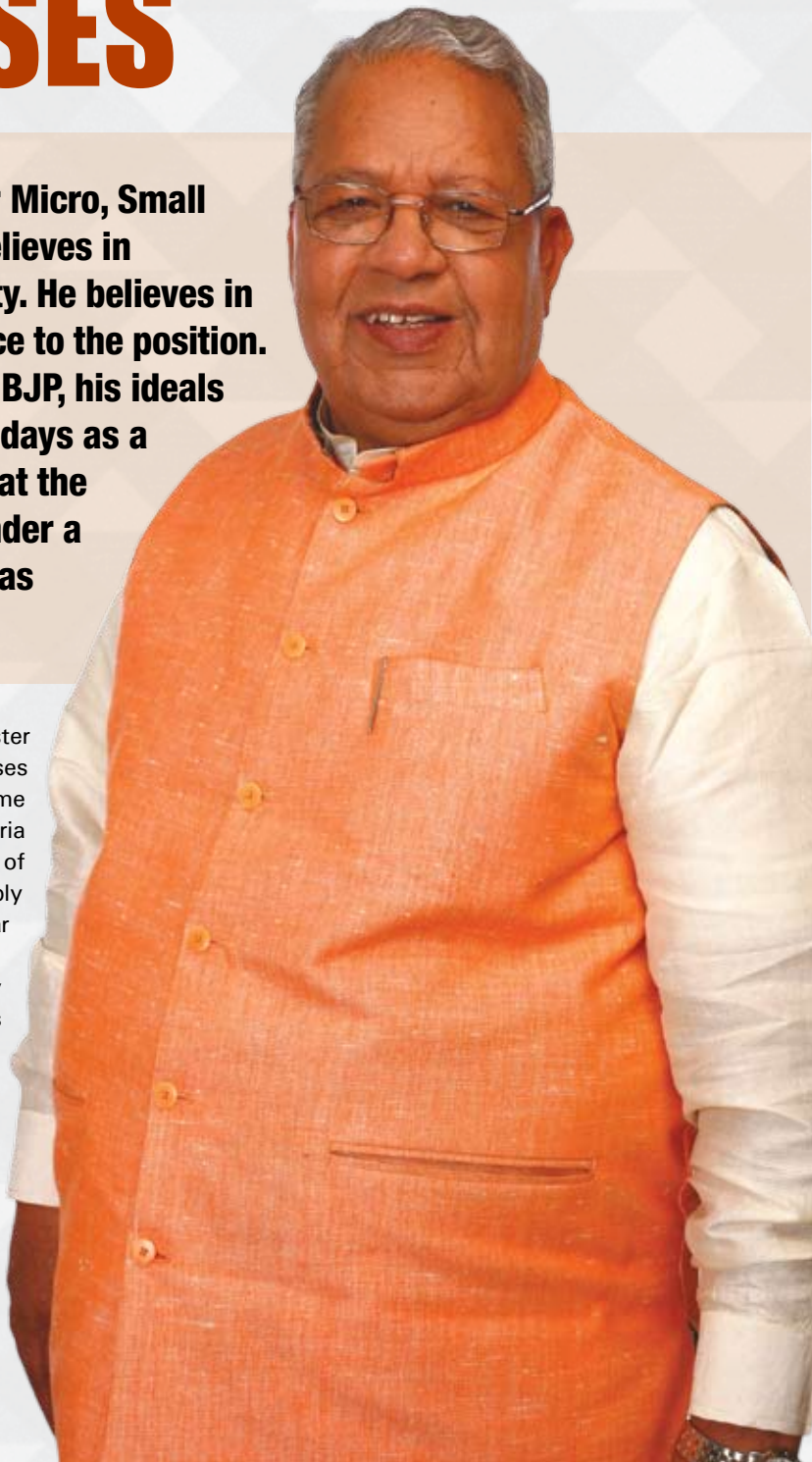
EXPANDING MICRO, SMALL AND MEDIUM ENTERPRISES

Kalraj Mishra, the Union Minister for Micro, Small and Medium Enterprises (MSME), believes in working for the welfare of the society. He believes in work and has never given importance to the position. Wonderful orator and a thinktank of BJP, his ideals have remained intact from his early days as a swayamsevak, till today when he is at the helm of affairs in MSME Ministry. Under a veteran like him, the MSME sector has immense scope and opportunities.

Kalraj Mishra, India's Union Cabinet Minister of Micro, Small and Medium Enterprises in the BJP-led NDA government of Prime Minister Narendra Modi, represents Deoria constituency in Uttar Pradesh. A member of Rajya Sabha and a MLA from Lucknow East assembly constituency, Mishra was also the President of Uttar Pradesh state unit of the BJP.

Born in a middle class Brahmin family of a very small village Malikpur (Saidpur) of Gazipur District as a fourth son of a family, Mishra obtained his M.A. degree from Mahatma Gandhi Kashi Vidyapith, Varanasi.

His political career began as early as 1955. Since childhood he was affiliated with RSS and later on, he became RSS purnkalik pracharak in 1963. Mishra, renowned Sanghpracharak, was the first elected National President of Bhartiya Janta Yuva



Morcha. He was three term member of Rajya Sabha in 1978, 2001 and 2006. He joined politics and held many party positions at state and national level.

Early in his career, Kalraj Mishra was inspired by the JP Movement. He worked as a chairperson of 'Sampurna Kranti' meaning Total Revolution. The movement was started by Jayaprakash Narayan in 1974 in UP. With his increasing involvement in politics, in 1978 he was appointed as the National President of the All India Janata Yuva Morcha. From here on his political graph kept growing and he finally reached the position of Cabinet Minister.

He was a Cabinet Minister in Government of Uttar Pradesh holding the portfolios of Public Works, Medical Education and Tourism during March 1997 – August 2000 period. During this tenure, he made sincere efforts to improve the condition of state highways. Mishra started a campaign wherein all state highways would be made crater free. He played a significant role in the formation of Uttarakhand. In 2012, Mishra contested Vidhan Sabha election as a BJP candidate from Lucknow East assembly constituency and won the seat for BJP. He initiated many developmental projects.

In 2014 Mishra became MP from Deoria and was later appointed as Cabinet Minister in the Modi government. He is the Minister of Micro, Small and Medium Enterprises since 26 May 2014. Committed to his new role, Mishra soon after resuming the office said, "The objective of this ministry is to make the common man self-dependent. Optimum utilization of human resources in the MSME sector and establishing a framework for this purpose is the need of the time and this ministry will work towards that goal. I aim to fulfil the expectations of the people". He believes in developing Entrepreneurship Mentality among the job seekers and want to



develop them as job providers.

The recent transformation to the Goods and Services Tax (GST) regime had engulfed the MSME sector in apprehension. But the minister was quick to allay the fears of the sector. "It is a very important tax reform. Small and medium industry should not be apprehensive about anything. We are doing workshops across the country to resolve all your issues," he said.

Under his leadership, around 1.1 million jobs have been created in the last three years through the flagship scheme of the MSME Ministry -- the Prime Minister's Employment Generation Programme. A National MSME Policy is in the offing as a report on its formulation has been prepared. The segment is expected to see some major reforms. The Ministry is planning to set up 15 new micro, small and medium enterprises (MSME) technology centres in the country for skill development of youths.

MSME is a crucial sector and it accounts for 8% of the country's total GDP. It is also one of the largest employment industries. Kalraj Mishra's experience and his association with BJP from a long time will definitely serve as a catalyst in MSME sector.

“Loan waiver has become fashion now. Loan should be waived but in extreme situations only as it’s not final solution”

M VENKAIAH NAIDU
Union Minister for Urban Development



“We are talking about FDI in plantation crops, so why not have more money come in also to ensure greater production in agriculture. Agriculture is going to be the biggest component of our exports and, therefore, yes I would be in favour of agriculture being accorded industry status”

SMT. NIRMALA SITHARAMAN
Commerce and Industry Minister

“Firstly, we do not need GM mustard because our state has enough traditional varieties with better yields. Secondly, I disagree with gene modification, which is nothing but meddling with nature”

PRABHULAL SAINI
Rajasthan Agriculture Minister



“Farmers suicide is a cause of concern ... Suicides should not take place, whether it is one or one lakh. We are very sensitive to this issue. There are various reasons for the suicides and the only solution is to increase farmers income”

RADHA MOHAN SINGH
Union Agriculture Minister



“It is totally incorrect to force seed companies to cut prices”

AJAY SHRIRAM
former CII president and Chairman & Sr. Managing Director, DCM Shriram