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From the Editor's Desk FERTILIZERS KEY TO FOOD SECURITY

ertilizers have become an integral part of the agricultural systems worldwide, and India especially. The Indian Fertilizer Industry has shown tremendous growth in the last five decades and at present ranks third in the world. India is the second largest consumer of fertilizers after China. - India also ranks second in the production of nitrogenous fertilizers and third in phosphatic fertilizers, whereas the requirement of potash is met through imports since there are limited reserves of potash in the country.



However, our dependence on inorganic fertilizers, especially the ones supplying primary nutrients has affected the soil health and to a large extent caused acute deficiency of micronutrients. The study – conducted by the Indian Institute of Soil Science (IISS), a key research body of the Indian Council of Agricultural Research – found that the soils of as many as 174 districts across 13 states were deficient in secondary nutrients like sulphur and micronutrients like zinc, boron, iron, manganese and copper. A systematic study on zinc in soil-plant-animal/human continuum has suggested a strong link of soil zinc status with grain/ seed zinc density and zinc levels in animal/human blood serum.

Encouraging the production and use of fertilisers fortified with micronutrients is the ideal strategy to overcome the problem of micronutrient deficiencies in Indian soils. Inadequate extension and promotional activities continue to be the number one constraint in popularizing micronutrient use in India. Quality research, aggressive extension and promotional activities, and availability of quality products are below par. One of the reasons for the state of affairs is lack of conducive policy environment. A multipronged approach should include research, technology transfer through extension, sampling and testing facilities and pricing policies of the government to address the issues at hand. Better partnership among all the stakeholders i.e. scientists, industry, government and farmers is the need of hour to address the problem of micronutrient malnutrition in soil-plant-animal human system.

In India, the government keeps a close eye on the fertilizer sector. To an extent, the Fertilizer Industry is highly regulated and monitored by the Government of India. The government supports the farmers in the form of fertilizer subsidies. Except urea, all the decontrolled fertilizers are sold at MRP fixed by the manufacturers. Urea on the other hand enjoys subsidies. Nutrient Based Subsidy (NBS) policy,New Urea Policy(2015),Direct Transfers Benefit (DBT) and Soil Health cards have tried to create a reasonable impact on the production and consumption of fertilizers in India.

As we move towards sustainable agriculture, our emphasis must be to maintain a balance between different nutrients in the soil. Chemical fertilizers, although may harm the fragility of the environment in higher doses, their presence is invariably mandatory to sustain and enhance agriculture production. So prudence and wisdom must prevail over our urge to intensive agriculture.

Anjana Nair

C O O T E O T S

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Cover Feature

FERTILIZERS FOR SUSTAINABLE AGRICULTURE



Fisheries

ORGANIC AQUACULTURE A POTENTIAL PROSPECT FOR INCREASING FARMERS' INCOME

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India – Asia's Seed Hub

Private sector is gearing up the needs of the small farmers

t has become imperative for the corporates to get involved in the development of the farming community. Only if the buying capacity of the farmers are expanded, can they entertain the inputs supplied by the companies. Considering this simple philosophy, the development of the farming community becomes the prime concern of the agri input companies today.

A recent study by the World Benchmarking Alliance (WBA)pointed out that India has emerged as a major seed hub in Asia, with four Indian seed companies featuring in top 10 of the first ever "Access to Seeds Index for South and Southeast Asia". The Access to Seeds Index published its first ever ranking of seed companies in South and Southeast Asia on their efforts to support smallholder farmer productivity. WBA is global multi-stakeholder initiative that measures and incentivise business efforts to achieve Sustainable Development Goals (SDGs).

India's potential might in agriculture and the immense possibilities the country offers have invited the interest of many foreign seed companies who are actively investing in India and the development of many home grown powerful seed companies. India has thus grown into a real powerhouse for the development and supply of quality seeds for smallholder farmers in the region. Nearly 21 companies sell seeds in India and 18 have invested in breeding and production activities in the country. According to the Index's first ever ranking, four Indian seed companies -- Advanta, AcsenHyVeg, Namdhari Seeds and Nuziveedu Seeds -- have made it to the top 10 seed companies in South and Southeast Asia on their efforts to support smallholder farmer productivity.

India is a country of small holder farmers. There are 100 million small farmers in India who effectively contribute 80 per cent of the food produced in the country. In effect they are the important producers of food grains in our country. However, they also have the least access to the improved inputs that are available in the market. The small holders represent an important market that has still not been fully explored by the private sector. Seeds which form the foundation of agriculture is also a carrier of traits and characters that can possibly determine the nature of crop production. Innovation at the seed level is the most easy and effective route to transfer the newest technologies to the farming community. However, their access remains still a contentious area. Extension efforts, primarily the responsibility of the public sector, is now slowly being shouldered by the private segment also. 83 per cent of the companies present in India provide some form of extension service. One of many examples comes from Nuziveedu Seeds, which has signed a memorandum of understanding with the Uttar Pradesh government to carry out collaborative extension work on rice and maize production with 40,000 farmers in 25 districts.

Agriculture is moulded by the challenges it face. Climate change, a phenomenon that is slowly usurping all the attention, affects agriculture too. Small and marginal farmers are considered to be the most affected ones. Unfortunately, they are also the ones who have the least possibility to tackle this eventuality with the available resource. Their needs and demands must be focused upon by the research and development teams while developing technologies or new varieties. The study has also indicated the interest of the private segment in this area as well. The domestic Namdhari Seeds and Nuziveedu Seeds scored high points in the index due to breeding programs with a strong focus on the preferences and needs of smallholder farmers.

Despite some excellent developments in agriculture, quality food is still not accessible to many sections of the society. With many challenges like climate change, food and nutritional security remains an arduous task. Seed industry is positioned at an advantageous position to lend the much needed support to global agriculture. But their efforts should extend beyond development of varieties to popularizing them among small holder farmers.

Bureaucrats to Man ASRB

In a departure from the tradition of 4.5 decades, a non-scientist will head the country's elite scientific body

storm is brewing in the appointment of the Chairman of Agricultural Scientists' Recruitment Board (ASRB). Α body spearheading the selection and appointment of agriculture scientists in the country now will open its doors to bureaucrat without a scientific background. The idea has already invited tremendous amount of criticism from the scientific community. Over the past few years, the body has been operating without a full-time chairman and has just one member.

An elite body involved in the recruitment of agriculture scientists in the country, ASRB has been instrumental in appointing scientists in all major agriculture institutes and universities in the country. The force behind building a cadre of farm scientists, ASRB is also in charge of All-India level Preliminary examination for recruitment of Scientists every year in 55 different disciplines of agricultural sciences. Considering the significant amount of responsibility held by the organization in searching for the talent, having a bureaucrat without any scientific credentials and just administrative skills invokes skepticism. The consternation that has build up was subsequent to an official advertisement seeking applications for the ASRB chairperson position, which closed on October 31, that said not just scientists or academicians with PhDs and 25 years of experience, but also retired or serving civil servants with 25 years of experience in public administration or agriculture and related sectors can apply for the post. This is the first time in the 45 years of ASRB's existence that the top job has been opened to bureaucrats.

A representation from the Agricultural Research Service Scientists' Forum — a body that represents research staff at the Indian Council of Agricultural Research (ICAR) — to the PM also failed to elicit any response.Interestingly, the government had constituted a high-level expert committee under the chairmanship of RS Paroda, former ICAR Director General and Secretary, Department of Agricultural Research and Extension (DARE), to look into the restructuring of the Board. Significantly, such a change was not part of the recommendations made by the panel, which also had two bureaucrats one serving and one retired — as members. Also, the ICAR governing body had earlier rejected a proposal to consider bureaucrats for the posts of Chairman and Members of ASRB.

This is particularly a delicate time for country's agriculture. Declining productivity and income from agriculture has elicited a flurry of reforms in the sector. Doubling farmers' income is yet a dream that has to be fully realized. Climate change is a reality that has descended upon the country's agriculture, and science is the foundation upon which such a threat can be addressed. Every other day, the entire chain constituting agriculture faces a new challenge demanding scientific intervention. In such a scenario the quality of the personnel in scientific position is important and so is the body involved in selection of those scientists. A bureaucrat, no matter how capable he is as an administrator will not understand the nuances and distinctions existing in a multidisciplinary discipline like agriculture.

It looks like the government is searching frantically for ways to fulfill its promise of doubling farmers' income and in the process trying different means that are deviant from the normal course of action in the hope that it may yield the desired result. So far, India has been able to achieve many records in agriculture which was undoubtedly, due to the direct involvement of the scientific community. If the government wants to intervene in this segment, better they increase the budgetary allocation to research and development and reduce their penchant towards debt waivers.

India needs a vibrant, skilled and dynamic research institutes manned by scientist of repute, not an administrator to manage affairs.

Cotton at WTO

US alleges that India is Under reporting its subsidies on Cotton

nother global trade war is in sight with once again United States leading the trial. This time the country on the other end is India. The United States has alleged that India has been breaching the permitted levels of trade-distorting domestic support for the past seven years through its market price support (MPS) for cotton.The US has charged that India paid trade-distorting subsidies to its cotton farmers well in excess of the limit of 10% for developing countries and Indian has been under reporting the issue to the World Trade Organization.

The US assumes that India's apparent MPS for cotton appears to be between 53% and 81% of the value of production in each of the covered years (2010-2017). India's notification for MY(marketing year)2015/16 showed a value of support, converted from US dollars, of Rs.1,176.48 million for cotton...By comparison, the United States estimates that India's MPS was Rs.504.150 million for MY2015/16 for cotton.

Surprisingly, this dispute is the second of its kind after a similar notification was issued by US on India's rice and wheat several months ago. In May, India came under attack from the US for its minimum support price (MSP) policy for foodgrains. India hit back, along with China, to demand that developed nations give up the bulk of their farm subsidies from 2019 onwards, escalating a demand that both countries had made in 2017.

The market price support for agricultural commodities is calculated as the difference between the applied administered price and external reference price prevailing in 1986-88 multiplied by eligible production. This is also a bone of contention that has been repeatedly raised by India and many other countries. India, along with more than 45 countries of the G-33 farm coalition, had demanded that the MPS must be calculated by using an external reference price of a recent period instead of a two decade old 1986-88, which was built into the equation following the Uruguay

Round of trade negotiations. However, the US, European Union, Japan, Norway and Switzerland, prefer to adhere to this methodology, at the same time blocking India's efforts in changing the system. Moreover, the US has used the rupee for calculating the market price support, while India calculates in dollar terms, which makes a tremendous difference. Also, the US was wrong to use total production for the calculation of MPS as opposed to India's calculation based on the procured production. Further, the Cotton Corporation of India does not procure more than 1% of the total production of cotton.

The AoA (agreement on agriculture) does not place a binding obligation on India to notify in a particular currency. It only requires taking into account the constituent data and methodology as in Part IV of a Member's Schedule, which India has complied to. In order to provide comparable estimates, India has been notifying its domestic support in US dollars since 1995-1996. India has followed a consistent approach in currency used while notifying its domestic support notifications.

Many believe this is the US tactic of pitting India against poor West African countries who are seeking substantial reduction in cotton subsidies provided by the US. Cotton prices have been spiraling down globally and Cotton subsidies in the US - amounting to \$3.9bn in 2001/02 - have been the single biggest force driving down world prices. The scale of the current crisis has made cotton the latest flash point for agricultural trade disputes at the World Trade Organization (WTO). Citing injury to its domestic economy, Brazil has accused the US of provoking and maintaining the deepest crisis in world cotton markets since the Great Depression.Falling world cotton prices have inflicted enormous damage on vulnerable people in the African region, undermining household nutrition and jeopardizing gains made in public health and education.

Subsidies are a distorting measure. But it is also important to protect the farmers in this risky business. India cannot stop subsides as long as we want to protect our farmers and their livelihood.

Subsidies to Export Sugar

India's export subsidies on sugar invites criticism

ndian sugar sector, burdened by consecutive gluts and low prices is not particularly in a sweet spot. The Indian government through a slew of measures is hoping to restore the stability in the sugar sector, albeit inviting tremendous criticism from around the world.

The government's decision to give export subsidy to clear out the domestic stock taking advantage of the firming international prices after the recent cut in global production estimates to 187 million tonnes (mt) for the year 2018-19 against 203 mt logged in the previous year, offers some amount of relied to the sector. Sugar mills have subsequently signed deals to export raw sugar for the first time in three years as a rally in New York prices to seven-month high along with government subsidies made. The better prices prevailing globally, export subsidy and the weakening rupee has made export lucrative this year. India last month approved incentives such as a transport subsidy for export and a direct cane payment to farmers to encourage cash-strapped mills to export surplus sugar in the 2018/19 season.

India produced a record 32.5 million tonnes of sugar in the 2017-18 marketing year and the output is estimated to be around same level or slightly lower in the current marketing year. The annual domestic demand is around 26 million tonnes. The country also has an opening stock of 10 million tonnes at the start of the current marketing year that began last month. To bail out the cash-starved sugar industry, the government had in June announced financial package of Rs 8,500 crore to the sector, mainly to boost ethanol capacity. Later, in September, it approved Rs 5,500 crore package that included production assistance to cane growers and transport subsidy to mills for export up to 5 million tonnes in 201819 marketing year. Under its 'comprehensive policy to deal with excess sugar production in the country', the government approved increase in the production assistance paid to growers to Rs 13.88 per quintal for the 2018-19 marketing year from Rs 5.50 per quintal this year in order to offset the cost of sugarcane to sugar mills. Besides these financial packages, the government has taken other measures in the last one year such as doubling of import duty on sugar to 100 per cent and scrapping of export duty.

But India's incentives to boost exports have not gone well with the other sugar exporters. Brazil and Australia view any subsidy by India, set to take over as the world's largest sugar producer this year, as a grave threat to the recent price recovery. They believe that export subsidies introduced by the Indian and Pakistan governments have contributed to a growing glut on global markets. Australia is reportedly considering joint action with Brazil to look into the feasibility of a formal complaint over possible sugar export subsidies by India. Australia has raised concerns over India's sugar subsidy dole out and questioned how the host of financial assistance measures announced this year are within the rules of the World Trade Organisation. However, India maintains that the country's sugar exports do not violate WTO rules, saying the country gives a production subsidy and not the subsidy for overseas sales.

In a post WTO world, these disputes are bound to occur. A country needs to protect its farmers/ producers from market fluctuations and other risks. This may not always align with the global principles of trade. So while taking such decisions, it is imperative that each country should offer explanations and take other countries into confidence. Transparency can quell many disputes.

CORPORATE CORNER

Agri input firms see higher profit on price hikes, normal monsoon

• Agricultural input companies have posted decent growth in revenue and net profit for the quarter ended September, with sales rising on normal monsoon rain and price hikes. PI Industries, for example, reported a 29 per cent jump in revenue to Rs 7.2 billion from the same period last year. Net profit grew 17.5 per cent to Rs 944 million. Rallis India posted 11 per cent growth in the quarter's revenue to Rs 6.5 billion and a 10 per cent jump in net profit to Rs 852 million. While companies have been able to pass on their raw material price hikes to consumers, the lag time of four to six weeks in absorbing the hike did marginally affect their profit margin. They aim to achieve the full benefit of the price hikes in the December quarter. "Performance across the business segment remained good despite the erratic southwest monsoon this kharif season. Though classified as normal, at a deficit



of 9.4 per cent against the Long Period Average, only 68 per cent of areas received normal rainfall. Our close working with farmers in providing knowledge, products and information to deliver better value out of crops delivered robust growth despite market challenges, like increased raw material prices and fluctuating commodities prices. We do hope for a better rabi season, with a normal forecast for the northeast monsoon and improved reservoir water levels," said V Shankar, managing director (MD) at Rallis India, part of the Tata group. Export-centric UPL posted 13 per cent growth in revenue, primarily because of an eight per cent jump in its September quarter volume growth. UPL generates a little over 80 per cent of revenue from export -- it raised product prices by an average of four per cent, as against declines of four per cent and one per cent in financial years 2016-17 and 2017-18, respectively. Other agri input companies have also raised their product prices by the same tune. Value-added and specialised chemicals saw double-digit price rises during the quarter.

NABI signs pact with four firms for coloured wheat

Nohali-based National Agri-Food Biotechnology Institute (NABI) has signed MoUs with four companies for seed and wheat-based product generation for 'coloured wheat' developed by the institute which is rich in nutraceuticals. Vidisha -based Premier (India) Seed Company, Hisar-based HABITAT Genome Improvement Primary Producer's Company and Bishwanath Agrawal (BNA), Purnea (Bihar) will produce and maintain coloured wheat seeds and will prepare coloured wheat products. NABI has also intertwined with Monicas (puddings and pies), a proprietorship firm with Monika Sood as proprietor in Mohali region for development of products from different types of colored wheat. Dr Monica Garg, scientist, NABI, said colored wheat is rich in anthocyanins that give it antioxidant properties. She said anthocyanins are phytochemicals that are found in fruits like blueberries and blackberries etc. act as antioxidants and show anti-inflammatory, anti-cancer, anti-aging activity and prevent heart disease and diabetes.

M&M net jumps 24% in Jul-Sept quarter

• Homegrown auto major Mahindra & Mahindra (M&M) on Wednesday reported 23.87% jump in standalone profit after tax at Rs 1,649.46 crore for the second quarter ended September 30. The company had posted a standalone net profit of Rs 1,331.57 crore in the same quarter last fiscal, M&M said in a regulatory filing. Total income during the period under review stood at Rs 13,834.87 crore. It was at Rs 12,745.49 crore in the year-ago quarter. Vehicle sales during the second quarter stood at 1,41,163 units as against 129,754



units in the same period last fiscal, a growth of 9%, the company said. Tractor sales were, however, down by 5% to 73,012 units in the second quarter as against 76,984 units in the year-ago period, it added. The company exported 9,244 vehicles during the current quarter, a growth of 18.9% over the corresponding quarter previous year. On the outlook, the company said, "Going forward, growth will be a function of evolving liquidity conditions as well as private and government spending." Among global factors, crude oil price behaviour and US-China trade policy manoeuvring will be the key factors to watch out for, it said.

Crystal Crop to Acquire Top Brands of Syngenta

• Specialty chemicals company Crystal Crop Protection is close to acquiring key insecticide and fungicide brands of Syngenta AG, said people aware of the development.If the deal materialises, it will mark Everstone Capital-backed Crystal Crop's fourth acquisition in 2018. The Delhi-headquartered company is planning to raise Rs 1,000 crore through an initial public offering. The portfolio of Swissbased Syngenta brands that are sought to be acquired include Proclaim, Tilt and Blue Copper, the persons cited earlier told ET. The acquisition will help the Indian R&D-based crop protection manufacturing and marketing company to strengthen its crop protection portfolio. In India, Syngenta is known for its high-quality crop protection products."This acquisition from Syngenta will enhance Crystal's penetration in the pulses, cotton, rice, wheat, vegetable and grapes markets in India. Further, the inclusion of these brands will help to strengthen its portfolio and provide best crop protection solution to farmers and thus increase their farm productivity," another person familiar with the matter said. The company recently received final observations from markets regulator Sebi regarding the DRHP it filed for raising Rs 1,000 crore via an IPO, comprising a fresh issue of up to Rs 545 crore and an offer for sale of up to Rs 455 crore. According to the draft red herring prospectus (DRHP), net proceeds of the IPO will be utilised toward prepayment/ repayment of certain working capital facilities, acquisitions, and other strategic initiatives and general corporate purposes. This will be Crystal Crop's fourth acquisition in 2018. Earlier this year it had acquired a chemical plant from Cytec India Specialty Chemicals & Materials, and the Indian sorghum, pearl millet and fodder seeds business of Syngenta India. It also acquired four brands (Furadan, Splendour, Affinity Force and Metcil) from Philadelphia-based chemicals maker FMC Corporation.In 2016, the company had signed an agreement with Germany's BASF SE to acquire the brand Bavistin. In 2011, it had bought Hyderabad-based Rohini Seeds and RohiniBioseeds and Agritech to enter the seeds market.

PepsiCo to pump in \$5 m to promote sustainable farming in India

Snacks and beverages major PepsiCo plans to invest \$5 million by 2020 to expand its sustainable farming programme in India. The company - which is the biggest buyer of chip-grade potato in the country - also plans to double its collaborative farming network for potato cultivation in India in the next five years. Christine Daugherty, Global Vice-President, Sustainable Agriculture, PepsiCo, said: "As part of PepsiCo's 'Performance with Purpose Vision', sourcing our agricultural ingredients sustainably is important for the growth of our business, food safety and to support crop resilience for continued and localised supply. India clearly is an integral part of our sustainable sourcing agenda." "As part of our continued commitment, we plan to invest \$5 million by 2020, for expanding the Sustainable Farming Programme in India," she added. PepsiCo is working with over 24,000 farmers in India, mainly potato farmers. Under its collaborative farming initiative, it is working directly with potato farmers across 11 States and will double this network in the next five years. On the Sustainable Farming Programme in India, Daugherty said, "We want to make a global impact which is locally relevant through our sustainable farming programme. We know we can't just come in with complete Western agricultural practices as they may not work in India. "So, our programme goes in and does risk analysis and assessment of environmental, social and economic factors. Post that risk assessment, we decide on how to engage with the farmers so they can grow better quality produce with less input costs which are resilient to environmental and economic shocks."

CropIn Technology to expand digitisation drive

• Encouraged with the success of its pilot project, CropIn Technology Solutions is all set to digitise details of another 20,000 farmer beneficiaries in 200 drought and flood-prone villages of Madhya Pradesh and Bihar next year. CropIn, a Bengaluru-based agtech startup had, in 2017, digitised 20,000 farmers' data in the two States to empower them in the World Bank-funded climate resilience project. Seventy per cent of these farmers are women. "In the last eight years, we have digitised 21 lakh farmers, 70 per cent of them in India and 30 per cent in developing countries in Africa, Asia, Europe and South America," Kunal Prasad, Co-Founder and COO, CropIn, said. The platform aims to digitise two crore farmers in the world in the next five years, he said, adding the startup has so far digitised 265 crops and 3,500 crop varieties globally. The 20,000 farmer beneficiaries in India under the World Bank-supported project are from 200 villages in the flood-prone Madhubani district of Bihar and the drought-prone districts of Sheopur and Mandla, and Gaya (Bihar). CropIn enables data-driven farming by connecting the different players in the agro-ecosystem, including companies working in seed production, agri-input, banking, insurance, government bodies, and development agencies. It operates in 29 countries, mostly emerging markets, and has digitised over 31 lakh acres of farmland, impacting the lives of nearly 16 lakh farmers globally. The Karnataka Government has partnered with CropIn to adopt data-driven farming solutions in 30 districts, he said. Changing trends in weather parameters have a significant impact on agriculture, thereby affecting food security, terrestrial ecosystems, economy, human health and social life. To ensure sustainability of farming, the Food and Agriculture Organization (FAO) had advocated building climate resilience practices empowering farmers to respond to climate extremities.

Agriculture Ministry Gears Up to Start Trade via e-NAM Among Seven States

• The agriculture ministry will, in the next two months, run a pilot project for interstate mandi trade through the electronic National Agriculture Market (e-NAM). This will enable a trader with a unified licence from one state to bid online for and procure commodities from another state, government officials said. Currently, seven states — Uttar Pradesh, Madhya Pradesh, Maharashtra, Gujarat, Andhra Pradesh, Telangana and Uttarakhand — are working on the modalities to establish interstate trade. "Plans are afoot to enable trade among states' agriculture markets to enhance transparency in the sale and purchase of agricultural output. It enhances



Uttam Fasal Uttam Enaam

competition among the trade and leads to better prices for farmers," said SumantaChaudhuri, managing director of the Small Farmers' Agriculture Consortium, the implementation agency for the e-NAM project. Trade in 585 mandis is currently happening on the electronic network, which helps discover price real time in a transparent manner. The government aims at integrating 200 mandis this year and another 215 next year with the e-NAM platform. There are about 2,700 APMC mandis and 4,000 sub-market yards in India. Officials in the agriculture ministry said the Uttar Pradesh government was exploring giving state trading licences to traders from other states. For this, it wants the authorities in the applicant's state to provide the legal documents. There are also discussions ongoing among officials of the agriculture ministry, SFAC and state mandis on how to settle disputes. "In the pilot stage, the dispute has to be settled by the mandi of origin where the trade is going to be executed," said an executive of Nagarjuna Fertilizers & Chemicals, which is responsible for the development, operation and maintenance of the e-NAM platform.

Govt gives nod to 11 States to procure pulses on MSP

● The Centre has approved procurement of pulses and oilseeds on minimum support prices(MSPs) under price support scheme in for the ongoing kharif marketing year started October, Farm Minister Radha Mohan Singh said. "We have received lots of proposals from the States to allow procurement of pulses and oilseed under price support scheme. So far, we have approved (procurement in) 11 states," he said. Under the price support scheme, crops are procured at MSP by nodal government agencies, consideration for which is credited directly to registered farmers. Most States have begun procurement, through drives by The National



Agricultural Cooperative Marketing Federation of India and State-run agencies. The procurement was prompted after bumper output this year led to legume and oilseeds prices declining sharply Singh said. The Centre estimated pulses output this kharif season at 9.22 mlntonne in 2018-19 (Jul-Jun), against 9.34 mlntonne while that of oilseeds is at 22.2 mlntonne up from 21.0 mlntonne a year ago.

New index to check ease of doing agri-business

• States may soon start receiving extra funding for the Agriculture Ministry's flagship schemes on the basis of their performance in encouraging agri-business, especially with regard to marketing, land and governance reforms. The Centre expects to roll out a new Ease of Doing Agri-Business Index early next year, which will rank the States on the basis of such reforms, as well as their investment in agriculture, increased productivity, reduction of input costs, and risk mitigation measures. "In future, the Ministry may consider rewarding the higher performing States [both in absolute and incremental terms] by linking the performance with allocation from flexi funds made available in various flagship schemes of this Ministry," says a recent concept note for the Index. NITI Aayog already brings out a Agricultural Marketing and Farm Friendly Reforms Index, rating States on their implementation of such reforms. In the initial edition of that Index in 2016, Maharashtra stood first in the rankings, followed by Gujarat. The proposed index has a wider ambit, but the focus is still on reforms, with marketing reforms (25%) and governance and land reforms (20%) carrying almost half of the weight of the parameters in its scoring system.

To clear stocks, govt gives states discount on pulses

● In a one-off move, the Centre is offering states nearly 3.4 million tonnes of pulses at a deep discount to pare its own ballooning reserves, following record procurement during 2017-18, to calm farmers roiled by low prices. Given fixed storage space, the government needs to clear stocks to make way for fresh summer harvests that are being procured by its agencies. Agriculture minister Radha Mohan Singh has written letters to all chief ministers, offering them centrally stocked pulses at a heavy discount of ~15 a kg to prevailing wholesale prices (which are anyway low) in their respective states. These could then be distributed in nutrition-based welfare programmes such as school meals, he wrote. This discount will also enable states to provide consumer packs of pulses at a rate that is likely to be 50% lower than retail rates, the minister said.



DBT Route Likely for Agri Power Subsidy, Farmers to Pay by Meter



◆ The government is considering paying a part of the agriculture power subsidy directly to farmers, instead of free or cheap electricity, as part of a move to rationalise farm sector subsidies. Coming ahead of general elections next year, the proposal, if it goes through, is expected to put more money into the hands of farmers, enabling more investments in the industry and higher consumption to boost the overall economy, officials familiar with the development said. A high-level committee, chaired by NITI Aayog member Ramesh Chand, has recommended that more than half-a-dozen subsidies to agriculture, amounting to over Rs 2.2 lakh crore, or Rs 11,340 crore per hectare, should be reconsidered to ensure that there is no over utilisation or wastage of subsidised power and urea, they said. "One of the key recommendations of the committee is to let farmers pay

for the power used as per metre and this subsidy will be reimbursed under direct benefit transfer (DBT)," one of the officials told on condition of anonymity. The committee's recommendations are being considered by NITI Aayog's top brass, following which the report will be submitted to the Prime Minister's Office and the agriculture ministry, the sources said. Subsidies to the agriculture sector include power subsidy, fertiliser subsidy, agriculture loan at lower rate of interest, irrigation subsidy, and insurance cover for farmers at lower premium rates. Of these, the power subsidy alone stands at over Rs 90,000 crore followed by fertiliser subsidy at Rs 75,000 crore. The government has already rolled out fertiliser subsidy to companies under DBT.

Centre issues guidelines for Operation Greens

• The Food Processing Ministry issued guidelines for Operation Greens, an initiative announced in the Budget with an outlay of Rs 500 crore. The programme aims to stabilise the supply of tomato, onion and potato crops (TOP) and to ensure their availability through the year without price volatility. As part of the short-term stabilisation measures, the Food Processing Ministry will provide 50 per cent subsidy for the transport of these crops from production to storage, and for hiring appropriate storage facilities. NAFED will be the nodal agency to implement these price stabilisation measures. The Ministry will also give financial assistance for long-term integrated value chain development projects which aim at capacity building of Farmer Producers Organisation (FPO) and their consortia, ensuring quality



production, post-harvest processing facilities, agri-logistics as well development of marketing and consumption points besides the creation of an e-platform for demand and supply management of TOP crops. "The pattern of assistance will comprise of grants-inaid at the rate of 50 per cent of the eligible project cost in all areas, subject to maximum Rs 50 crore per project. However, in cases where the project implementation agency are farmer producers' organisations, the grant-in-aid will be at the rate of 70 per cent of the eligible project cost in all areas, subject to maximum Rs 50 crore per project," an official statement said. The government has identified various tomato, onion and potato clusters in the country for this initiative.

West Bengal govt offers Rs 7000cr farm loan

● The Mamata Banerjee government has decided to disburse farm loans amounting to Rs 7,000 crore among farmers at a curtailed interest rate of 2 per cent through cooperative banks and cooperative societies. The move is aimed at mollifying farmers, who find it difficult to get loans from commercial banks, ahead of the 2019 Lok Sabha polls. "It has been noticed that lakhs of farmers, particularly those living in remote areas, don't get support from commercial banks. We iwill disburse farm loans worth Rs 7,000 crore before March next year. This will boost the economy in the rural areas," cooperation minister Arup Roy said on the sidelines of a programme at the New Secretariat building in Calcutta. According to sources, the government decided to increase the quantum of farm loan through the cooperative banks and societies after receiving complaints that farmers in remote areas don't get loans from commercial banks.



"There are 710 gram panchayat areas where no bank branches could be established despite the government's best efforts. So the state government recently decided to allow 2,661 cooperative societies to work as branches of cooperative banks so that more farmers can be brought under the banking net," said a senior cooperation department official. "The quantum of farm loans has been increased to Rs 7,000 crore from Rs 5,200 crore last year. The rate of interest has been brought down to 2 per cent from 4 per cent," he added. Several governments have been facing farmers' wrath. Thousands of farmers led by Left parties had marched in Maharashtra demanding farm loan waiver.

Punjab farmers hop banks to avoid loan repayment

• Banks are left high and dry even after robust income of cultivators on the backdrop of bumper paddy season this year as the farmers are consciously depositing their income in another accounts and avoiding the lending banks. Bankers suspect the intent of the farmers and fear a further spike in non-performing assets (NPAs). Since September 2017, the NPAs of various banks under agriculture sector have increased to Rs 8,319 crore in Punjab. The state has 7,175 branches of commercial, cooperative and regional rural banks. The government agencies and private millers in Punjab have already procured over 150 lakh metric tonnes of paddy and most of the payments have been made to the farmers within 72 hours of procurement. Ideally, they should have deposited



their money in the bank branches that had extended crop loans to them. But, they are concealing their income from the lenders, apparently not to repay the debt and later reap the benefit of debt waiver in an election year, said bankers, who were in Chandigarh to attend the 146th meeting of the state-level bankers committee for Punjab. The farmers do not want to deposit their income in the account of the lending banks as they fears that their money will be immediately adjusted by the banker against principal and interest. They also expect a loan waiver ahead of the 2019 General Election, bankers said. Due to announcement of debt waiver for small and marginal farmers up to Rs 2 lakh, the farmers in the state have stopped making repayments, which has adversely affected the

recovery scenario and triggered the NPAs, they said. Bankers are planning to take up the matter with the state government. Punjab had notified a debt-waiver scheme for the small and marginal farmers up to Rs 2 lakh on October 10 last year. The bankers blame the state government for not implementing the scheme efficiently and hence it is creating a bad credit culture. The agriculture sector NPA is around Rs 8,952 crore, which is 11.20% of total agriculture advances as of September 30, 2018 compared to 7.19% during the corresponding period previous year. As of September 2017, the total NPAs under agriculture loans was Rs 633 crore. The NPAs increased by over Rs 8,319 crore during the past one year to cross Rs 8,952 crore on September 30, 2018.

Firms earned Rs 15,795 crore in 2 years of Fasal Bima Yojana

Insurance companies across the country earned a whopping Rs 15,795 crore as profit in two years from the Pradhan Mantri Fasal Bima Yojana (PMFBY), according to a reply received under the Right to Information Act. While the farmers' wait for increase in income continues, the profit of insurance firms increased by one-and-a-half times in just one year of the introduction of the PMFBY. The insurance firms posted a profit of Rs 9,335.62 crore in 2017-18 — a robust growth of 44.52% compared to the previous year's (2016-17) profit of Rs 6,459.64 crore in the country. Information received from the Union agriculture ministry by RTI activist PP Kapoor revealed that 11 insurance firms, including government-owned Agriculture Insurance firms got a gross premium of Rs 22,362.11 crore and paid an insurance claim of Rs 15,902.47 crore to 3,01,26,403 farmers in 2016-17. Similarly, these firms disbursed claims of Rs 15,710.25 crore against a premium of Rs 25,045.87 crore to 1,26,01,048 farmers. The RTI reply, however, added that about Rs 512 crore approved insurance claims are yet to be paid, while majority of Rabi crop claims are yet to be estimated/approved.

Amitabh Bachchan to meet UP farmers to pay off their loans

• After Maharashtra, megastar Amitabh Bachchan will pay off loans of farmers in Uttar Pradesh and will personally meet some of them to give them their bank letters. He will arrange for 70 farmers to travel to Mumbai and receive their bank letters, his spokesperson has said. The superstar will be taking care of 1,398 farmer loans from Uttar Pradesh amounting to over Rs 4.05 crore. Amitabh has done an 'OTS: One Time Settlement with Bank Of India' and cleared the farmer's loans with the bank. He has also invited 70 farmers to Mumbai by blocking an entire train compartment for their travel, to personally give them their bank letters.



Banks' bad loans under farm loans rise to Rs 9,000 cr in Punjab

• With farmers "stopping" repayment of crop loans because of debt waiver of up to Rs 2 lakh, non-performing assets under agriculture loans have risen to nearly Rs 9,000 crore in Punjab, bankers said. Due to debt waiver for small and marginal farmers up to Rs 2 lakh, farmers in the state of Punjab have stopped making repayment of their crop loans and the recovery scenario is being adversely affected," according to the State Level Bankers Committee report. Notably, under the scheme relief, up to Rs 2 lakh would be provided to marginal and small farmers who have crop loans from cooperative institutions, public sector banks and other commercial banks



as on March 31, 2017. A bank official said several farmers were reluctant in repaying their crop loans and it has become one of the reasons in the rise in NPA level under farm sector. As per SLBC report, the NPA under agriculture sector was to the tune of Rs 8,952 crore as on September 30, 2018 as against Rs 633 crore in corresponding period of last year. The NPA amount of Rs 8,952 crore was 11.20 per cent of outstanding agriculture advances as against 7.19 per cent in corresponding period of last year. The NPA level as percentage of total advances also rose from 2.60 per cent in September 2017 to 3.47 per cent in 2018. The total outstanding agriculture advances in Punjab were to the tune of Rs 79,963 crore as on September 30, 2018, as against Rs 88,122 crore in corresponding period of last year.

CM Chouhan offers farmers bonus over MSP

• Election-bound Madhya Pradesh has decided to try out yet another new scheme to compensate farmers: cash payment of Rs 500 per quintal (100 kg) of soyabean and maize, even if growers of these commodities get prices equivalent to federally fixed minimum support prices (MSPs). The decision to offer a flat bonus means the state government will not implement the so-called PM-AASHA (Pradhan Mantri Annadata Aay Sanrakshan Abhiyan), a programme announced by the Centre on September 12 to ensure remunerative prices to farmers. This is because the guidelines for PM-AASHA don't include a flat bonus, implying that the state government will have to fund the programme on its own. Elections to the state's assembly are scheduled to be held on November 28. The decision on the flat bonus was made on October 5, a day before the model code of conduct that prevents governments from taking policy decisions that could affect the outcome of the polls, came into effect. Like many other states, Madhya Pradesh has witnessed protests by farmers hit hard by the agrarian crisis affecting cultivators across India.

Punjab govt to reach out to farmers via social media

• Having exhausted traditional means to convince wheat cultivators about the judicious use of fertilisers, the Punjab Agriculture Department has resorted to social media such as Facebook and WhatsApp groups in the current rabi season. "There are farmers groups on Facebook and WhatsApp at block and district levels. We are trying to reach out to them through the social media. In addition to this, state agriculture officials, scientists from Krishi Vigyan Kendras and Punjab Agricultural University will visit villages, tehsils and districts and educate farmers to restrict the usage of urea and DAP," Punjab Agriculture secretary KS Pannu said. Pannu says the target is to reduce the usage of urea and DAP by 10%. "The per-acre consumption of fertilisers in Punjab is the highest in the country. The farmers have been using fertiliser in excess of the dosage recommended by Punjab Agricultural University," he added. Around 13 lakh tonnes of urea and 5 lakh tonnes of DAP (diammonium phosphate) are used in the rabi season on crops such as wheat, oilseeds, pulses, sugarcane, potatoes, vegetables, fruits and fodder.

Gujarat to begin procuring groundnut

• Groundnut procurement is set to kickoff for the ongoing kharif season at about 122 centres in Gujarat. Notably, with prices dropping much below minimum support price (MSP) levels of Rs 4,890 a quintal, farmers rushed for online registration to participate in the procurement process which opened on November 1. After facing criticism for corruption and malpractices in groundnut procurement last year, the



State has announced procurement through the State Civil Supplies Corporation. The procurement at all centres will be videographed and the government will use warehouses of the State Warehousing Corporation (SWC) instead of Nafed warehouses which were used last year. Groundnut prices at Rajkot market quoted in the range of Rs 3,750-4,720 per quintal on Wednesday. The State government has announced bonus of Rs 110 per quintal over and above the MSP, making the effective procurement price at Rs 5,000 per quintal. The prices fell after the State projected crop size of 27 lakh tonnes at the yield of 1,836 kg per hectare for this year as against 32 lakh tonnes last year. The sowing was registered at 14.68 lakh hectares, marginally less than last year. Arrivals have started in large numbers at most markets, which were closed due to a strike by the traders and farmers demanding implementation of Bhavantar Bhugtaan Scheme for the oilseeds. The strike was withdrawn after an agreement between the traders and with the government.

Tur and chana farmers in Maharashtra to get Rs 480-crore grant

> The Maharashtra government has decided to give a grant of Rs 480 crore to Chana and Tur farmers who had registered under the government's procurement scheme last season but their produce was not procured. The government has decided to give an endowment of Rs. 1,000 per quintal. Farmersshall receive grants for a maximum of 2 hectares. The Maharashtra State Cooperative Marketing Federation has been given the responsibility of ensuring that the grants reach the farmers, senior officials said. Last season several farmers had registered themselves for the government's programme, but did not receive alerts for purchase from the government agencies. Those farmers who had received confirmation from the government but did not sell their produce have been disqualified from the scheme. According to senior official, lists were being prepared by the Maharashtra State Cooperative Marketing Federation and the process of compilation is on and some of the grants may have been disbursed for the kharif season of 2017-18.

UP Govt may Add SAP to its Sugarcane

In the country's biggest sugar-producing region — Uttar Pradesh, the state government is likely to do a marginal increase for the state advised price (SAP) on sugarcane, government sources said. Last year, the state government had increased prices by 3.3% to Rs 315 a quintal. The state is expecting a 12% increase in cane production this year at 213.1 million tonnes and a similar increase in sugar production at 12.5-13 million tonnes. "We will ensure sugarcane produced in the state is crushed and that farmers gets timely payments this year. These are the two biggest concerns of farmers," said Suresh Rana, minister at Sugar Industry and Cane Development Department, Uttar Pradesh. As 51 mills out of the 121 in the state already started cane crushing, officials in the department said the government was likely to announce the SAP for sugarcane in the coming days. "The hike can be similar to the previous year of Rs 10 a quintal," said an official at the ministry. The industry said it's facing deficit on its cash flows due to cane pricing and depressed sugar prices. Any further increase will impact them. Current wholesale prices of sugar in the state were ruling at Rs 31.5 a kg while the mills said that they need a minimum price of Rs 34-35 per kg to be profitable.



Karnataka may have own crop insurance scheme

• After Bihar, drought-striken Karnataka proposes to have its own farmer-friendly crop insurance scheme. "There are apprehensions that the policy being implemented by the Centre is not beneficial to farmers as we feel that the parameters adopted to assess crop losses are complicated and the claims process is also delayed," said NH Shivshankar Reddy, Karnataka Agriculture Minister. Some of the claims for the 2016-17 cropping season estimated at around Rs 150 crore are still pending. "We are examining the scheme adopted by Bihar and also studying the financial implications of having our own crop insurance scheme," Reddy said. The state has budgeted Rs 845 crore towards crop insurance premiums. Bihar had launched its own crop insurance scheme during the kharif season this year to compensate farmers better. Karnataka, which is reeling under drought due to a weak southwest monsoon, has pegged the crop losses at Rs 16,662 crore. The State has sought assistance to the tune of Rs 2,434 crore from the Centre under the National Disaster Relief Fund. Reddy said crops such as maize, groundnut, jowar and pulses have suffered damages on account of the rain deficit.

Poor irrigation facilities hit Assam's agri sector

• Of the total 30.40 lakh hectares cultivable land in Assam and the assessed irrigation potential of 27 lakh hectares, the State's irrigation department could bring only around 8.23 lakh hectares under its schemes so far. But the story doesn't end there. The irrigation potential available for utilisation at present is just 4.81 lakh hectares and the potential utilised during the year 2017-18 is merely 2.32 lakh hectares. According to official records, the irrigation department, since its inception, has completed 16 major/ medium projects and 2,387 minor schemes. However, 426 schemes are lying defunct at present, out of which 251 are repairable and 175 are irreparable. A total of 31,344 hectares of irrigation potential created was lost due to malfunctioning of the 251 repairable schemes. Sources said many of the defunct schemes were lying in that state due to lack of maintenance. "In many cases, there were small snags which could have been averted had there been timely intervention," the sources admitted. Mechanical reasons were cited for the huge gap between the irrigation potential available and utilised which is around 2.49 lakh hectares. "In some cases, it is due to geographical terrain. But one major factor is mechanical. Schemes are lying defunct or are partially functional and hence farmers are unable to get benefit of the projects," the sources said. Agriculture experts link the growing prices of vegetables and slow growth of the cultivation sector to the pathetic irrigation facilities in the State. "Less than 20 per cent of the cultivated land have access to irrigation facilities and the rest is solely dependent on the rains. During the lean period, they cannot cultivate. In the Rabi season, the Bodo rice is cultivated only in the irrigated pockets of lower Assam, despite the crop having huge potential. The production of this variety is much more," officials in the agriculture department said.

India to Dispute US' Claim of Under-reporting Cotton Subsidies

India will dispute US' findings that claim New Delhi paid trade-distorting subsidies in the last seven years to its cotton farmers in excess of 10% permitted for developing countries. The US has alleged that India provides market price support or MPS for cotton "vastly in excess of what it has reported to the World Trade Organization (WTO)" and it ranged from 53-81% of the value of production from 2010-11 to 2016-17. This is the second counter-notification by the US attacking India's subsidy numbers. In May, the Trump administration had challenged India on the basis of support given to wheat and rice. However, the latest salvo is being seen in the light of the US targeting the cotton subsidies given by African countries to their poor farmers. In its latest counter to India's subsidies, the US said: "India's notifications for the years at issue appear to dramatically under-report the value of India's MPS for cotton". The WTO Agreement on Agriculture defines subsidies on the total value of agriculture production while the US has challenged India on the basis of support given to individual products. Similarly, the agreement doesn't specify the currency in which countries have to report their subsidy dole out.

Pomegranate exports likely to run into EU roadblock

With a bumper pomegranate season in full swing, around 85,000 tonne is expected to be exported during 2018-19 season. However, several countries including Europe, Russia, Indonesia and China have imposed stricter Residue Monitoring Plan (RMP) for pomegranate imports from India this year. "The Residue Monitoring Plan (RMP) for grapes in Europe is normally 75 mg per kg but for pomegranates it has been brought down to 2 mg per kg thus making it difficult for pomegranate growers in the country to export the fruit," said Prabhakar Chandane, chairman, Maharashtra Pomegranate Growers Research



Association (MPGRA). "We have written to Agricultural and Processed Food Products Export Development Authority (APEDA) to intervene and seek concessions from the European Union (EU) for bringing down the limits to 10 mg per kg," Chandane said. The association sought a similar concession last season without success. "Despite drought, pomegranate production is likely to touch 15 lakh tonne and exports should be around 85000 tonnes," he said Out of 75000 tonne, nearly 10,000 tonne is likely to be exported to Europe, 30,000 tonne to Bangladesh, 40,000 tonne to West Asia and 5000 tonnes to other countries. The first crop of the season is likely to come up in July to September period.

Farm exports go past \$9 billion mark in H1

• Higher price realisations for commodities such as rice and buffalo meat, despite a decline in volumes, have helped push up farm product exports in dollar value terms for the April-September period in the current financial year over the corresponding period last year. Total value of shipments under Apeda's product portfolio exceeded the \$9 billion mark for the said period. In rupee terms, the value of the shipments registered an increase of 8.9 per cent aided by a weak currency at Rs 61,789 crore (Rs 56,741 last year). Despite a dip in volumes on account of a slowdown in purchases by key buyer Iran, basmati rice exports in value terms were up by about 6 per cent in dollar terms and around 12 per cent in rupee terms on higher pricing. Iran had imposed a ban on basmati imports from late July to protect its domestic growers. The average realisations for basmati were higher at \$1,082 per tonne as against \$997 in the corresponding period of the previous year. In rupee terms, basmati rice exports stood at Rs 15,331 as against Rs 13,706 crore. Like basmati, non-basmati rice shipments also suffered a slowdown on account of higher duty imposed by Bangladesh and reduced purchases from African countries. However, the average per-unit realisation was higher at \$411 per tonne as against \$407 in the corresponding of the previous year. A similar trend was also witnessed in buffalo meat shipments during the period. Basmati is the largest product in Apeda's product portfolio, accounting for a 25 per cent share of total earnings, followed by buffalo meat at 21 per cent and non-basmati rice at 17 per cent. However, categories such as pulses, fresh vegetables and dairy products witnessed a different trend, wherein the volumes grew but the average per-unit realisations were down on account of a dip in prices.

Cashew Exports may Fall to 25-year Low

India's cashew exports could drop to an over two-decade low this fiscal year as traders continue to go slow on shipments due to falling prices in overseas markets. Processor exporters—who depend on imported nuts for over 60% of their requirement—are saddled with raw nuts bought



at high prices and are loath to export the ready products as rates in global market have dropped. "Exporters are saddled with raw nuts purchased at high prices which they are processing and exporting under contractual obligations. They can make profit only if

the prices touch \$5 per pound," said P Sundaran, MD, Sreelakshmi Cashew Company. Last year, India exported 84,352 tonnes of cashew valued at Rs 5,871 crore. According to industry executives, the export quantity this year is expected to fall below 70,000 tonnes, a level seen almost 25 years ago. For the five months ended August 2018, exports showed a 34% slide from a year ago to 25,765 tonnes. In value terms, the drop was 33% from the year-ago period to Rs 1,788 crore. 2018-19 is turning out to be a tough one for Indian cashew trade, with exporters having little choice but to sell kernels processed out of expensive imported raw nuts at lower prices. "Cashew kernel prices dropped over \$1 this year to \$3.50-3.60/pound. The exporters are booking losses," said K Prakash Rao, managing partner of Kalbavi Cashews.

China may open doors for soyabean from India

Ochina is likely to open its doors to soyabean from India after allowing the import of non-basmati rice and raw sugar to address the worsening trade imbalance between the two countries, according to senior government officials. "With China no longer willing to purchase soyabean from the US due to the on-going trade discord between the two, there is a big opportunity for Indian soyabean in the Chinese market. Senior trade officials from both countries discussed the steps to start imports. from India during a recent meeting in Shanghai," an official told. Soyabean is one of the items on which China imposed retaliatory duties of 25 per cent against the US in response to similar levies imposed by the Trump administration on Chinese products. "China, which buys more than half of the world's soyabean produce, is importing huge quantities from Brazil to replace what it sourced from the US. Once it gives clearance to Indian exporters, it can start buying from India too," the official said. China had already cut import tariffs on soyabean and soyabean meals from Bangladesh, India, Laos, South Korea and Sri Lanka in July to prepare for more imports from these countries following its reduced purchases from the US.

Australia takes India to WTO over sugar subsidies

• Australia said on Friday that it will take legal action against India, the world's second-largest sugar producer, at the WTO over subsidies which it said caused a "significant downturn" in world sugar prices and hurt Australian producers. Australia alleges that the subsidies, which have seen Indian sugar production leap from an average 20 million tonne to 35 million tonne this year, far exceed the level of farmer assistance permitted under WTO rules. The action, known formally as a counter notification, comes after Australia has repeatedly raised the issue with India directly. It means the issue will initially be discussed at the WTO's Committee on Agriculture meeting scheduled for later. Trade Minister Simon Birmingham said it was time India, the world's second-largest sugar producer, was held accountable for its market distorting policies on sugar.



Vegetable oil imports drop 2.7% in 2017-18

The country imported 15 million tonnes (MT) of vegetable oils during the 2017-18 oil year ended October 31, down 2.72 per cent from the year-ago period, industry body Solvent Extractors' Association of India (SEA) said Thursday. The world's leading vegetable oil buyer had purchased 15.4 MT in the November 2016-October 2017 period . "During 2017-18, imports increased in the first quarter. However, imports decreased in the second and the third quarters due to revision of import duty in June, fast rupee depreciation and also credit crunch...," the SEA said in a statement.



Muktsar farmers turn paddy stubble into compost

▶ Even as North India is facing air pollution due to the burning of paddy stubble, some farmers in Muktsar district have started the practice of preparing compost from stubble and cow dung. To inspire the farmers to adopt this environment-friendly practice, Vellore-based C Srinivasan, project director of the Indian Green Service and consultant of the Solid Liquid Resource Management (SLRM) project, has held some training camps at Udekaran and Karamgarh villages here. Some farmers have opted for it on a trial basis saying that the disposal of stubble by engaging a contractor to make bales is an expensive method, which takes Rs 2,000 per acre. Sukhchain Singh, a farmer from Udekaran village, said, "We have made a six-foot-high stack of paddy stubble and soaked it with the mixture of cow dung and water. The



bacteria generated from the cow dung will turn the stubble into compost in 60 days, which will increase the nutrient level of soil for the next crop and lessen the need of water as well." Meanwhile, the district administration, too, is spreading awareness among farmers that if the compost can be prepared from even dry leaves, then why it can't be prepared from the crop residue. Baljinder Singh Brar, Chief Agriculture Officer, Muktsar, said, "I have visited Udekaran village, where farmers have started making compost from paddy stubble on a trial basis. If this method proves successful, it can solve the problem of stubble burning. Then other farmers, too, will be motivated."

Red rice of Lakhimpur to be exported soon

• There is good news for the farmers of Lakhimpur. The red rice of the district, produced from bao dhan, will be exported to foreign countries very soon. Bao dhan has been cultivated in the State since time immemorial. It is a deep water paddy variety which generally grows in areas having higher land submergence that are not suitable for other varieties of paddy. A large section of farmers in the State has cultivated this variety of paddy on the alluvial soil of the Brahmaputra Valley without using chemical fertilizers. This variety of paddy is grown in abundance on the soil enriched with alluvium left by the Subansiri River. It produces a particular type of iron rich-red rice whose red colour is conferred by the anthrocyanin pigments. They are rich in micro-nutrients like iron and zinc, Vitamin A and antioxidants. The demand for the red rice, produced through organic farming, has grown in the international market at present due to its medicinal and nutritional value. Therefore, Nature Bio-food, a Haryana based company, has come forward to buy the red rice of Lakhimpur and made a deal with 500 farmers of five villages in the district which have become fertile due to the alluvium of the Subansiri River. The Regional Agricultural Research Station (RARS) of North Lakhimpur selected these five villages have been producing bao dhan year after year without using any kind of chemical fertilizers. Aditi Organic Certification Private Limited, an institution of Bengaluru, has meanwhile certified these villages as organic farming villages.

Drones to identify pests and spray fungicide in arecanut plantations

Season controls and the exact plant and spraying plant protective chemicals on the mergen of the spray fundicides of the fruit rot diseases. The fundation of the exact plant is and exact plant is the fruit rot disease. The fundation is the exact plant is and the exact plant is the right time. The delay in spraying leads to the spread of disease. Stating that drones can spot the exact plant where the disease has started, he said this can ensure on-time spraying of fungicide on the affected plant. Chowdappa said the CPCRI is working with a Bengaluru-based start-up on this project. The process of converting information on diseases and pests to machine language is on. The CPCRI should be able to come out with a prototype on this within a year, he said.

Green Revolution architect MS Swaminathan felicitated for winning World Agriculture Prize

• "It will not be an exaggeration to place MS Swaminathan on par with Indian agriculture," said Union Agriculture Minister Radha Mohan Singh. He was addressing a function to felicitate Prof M S Swaminathan for receiving the first World Agriculture Prize, in October, in New Delhi. The event was organised by Tamil Nadu Agriculture University, Coimbatore. The Minister said Swaminathan, called the architect of India's green revolution, singlehandedly turned around Indian agriculture from the food crisis that plagued the country between the 1960-80s. "In a matter of two decades, our country, which was carrying begging bowl to other countries for food grains had become self-sufficient and we must all be thankful to MS Swaminathan for this," Singh said. Listing out various farmer-centric schemes implemented by the Centre, Singh acknowledged that initiatives such as e-NAM, Soil health cards, micro & drip irrigation and crop insurance are based on the recommendations submitted by Prof Swaminathan when he was appointed chairman of the 'National Commission for farmers' by former Prime Minister Atal Bihari Vajpayee in 2004. "In fact the change of name from Ministry of Agriculture to Ministry of Agriculture and Farmers' Welfare was one of the recommendations of Prof Swaminathan," Singh added. The Minister also highlighted the contribution of the professor in building self-reliance in the area of pulses production by setting up 150 seed hubs across the country, resulting in record production of 22 million tonnes of pulses.

Rice Knowledge Bank soon for Assam's paddy farmers

• In order to address the knowledge gap between agricultural research and practices in the paddy fields, a Rice Knowledge Bank (RKB) is going to be launched very soon by Assam Agricultural University with the technical support from International Rice Research Institute (IRRI) under APART project, a press release stated. To initiate the process, a Knowledge Management Committee Workshop was organised on November 5. RKB – is a digital extension service that provides practical knowledge solutions specialised for small-scale farmers in developing countries. Attending the inaugural meeting, Dr Sudhanshu Singh, coordinator, South Asia and project leader of APART project IRRI highlighted the Rice Knowledge Bank activity of APART project and its importance in disseminating information to the farmers' level. Haren Baisya, Agriculture coordinator of ARIAS society, expressed his concern over sustainability of the digital platform and asked IRRI and Assam Agricultural University to take initiative to make it a grand success. Dr Prasanna Pathak, Director, Extension Education, Assam Agricultural University hopes to prepare a Rice Knowledge Bank in line with IRRI Rice Knowledge Bank for supporting the extension professionals. The meeting was facilitated by Dr Kanwar Singh, resident consultant, APART-IRRI for Assam.

Efforts on to harness AI to improve tea quality

• The Tea Research Association (TRA) is planning to harness front line technologies based on artificial intelligence (AI), chatots and sensor-based machinery to boost tea quality while equipping the age-old industry to face the ravages of climate change. TRA has tied up with two start-ups that will show the way forward in these initiatives, secretary Joydeep Phukan said. The proverbial two leaves and a bud or three leaves and a bud is crucial for determining tea quality, although this norm is not always followed, an industry official said adding that while the violation was most common in the small tea-grower sector, the organised sector workers, too, were occasionally found to be engaging in this practice. Pointing out that the "fine leaf count" of a batch of tea will be detected through AI, Mr. Pukhan clarified that a batch is said to be of good quality if the fine leaf count (of two or three leaves to a bud) is 60% or above. This is good for quality and is adjudged as good manufacturing practice. For this TRA has tied up with Agnext Technologies. This company would also develop a chatbot which would be programmed to answer tea-cultivators queries on various issues. "Tocklai's 100-year-long research library has now been digitised and this vast repository can be utilised," said Mr. Phukan.

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How handsets are helping detect counterfeit seeds in Kenya

Desides more unpredictable weather and changing crop diseases, Kenyan farmers face another worry: counterfeit seed. Seed sold as something other than it is — the wrong variety or with the wrong characteristics, sometimes marketed with a falsified certificate of authenticity — can make the difference between a bumper crop and a failed harvest, farmers say. But a push by the Kenya Seed Company, a government-owned firm, to help farmers verify the authenticity of seed via mobile phone technology, is paying off, farmers and other backers say. Under the Kenya Seed Company effort, the firm has attached stickers inside bags of seed that contain a scratch-off code. Farmers send the code via SMS message and get an instant response as to whether the code — and the seed — is valid, said Esther Cherop, a saleswoman at Kenya Seed Company.

FERTILIZERS FOR SUSTAINABLE AGRICULTURE

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griculture in India has undergone a spectacular transformation from the clichéd begging bowl in the fifties to being the bread basket today. The transformation was the result of years of research and development and trials that eventually made an impact on our food

that eventually made an impact on our food production front that today feeds us and the world. Although several factors played into this, fertilizers were a critical input that considerably raised our production potential. As we moved away from our subsistence level of farming to something more intensive and rigorous, many non-descript varieties gave way to varieties that were more specific in their needs. Fertilizers were a necessity for this system to deliver and hence was made sure that it was available to the farmers unhindered. The subsidy system ensured the access of cheap and quality fertilizers on time. The results that followed justified the rationale of this form of agriculture and what trailed rewrote the history of Indian agriculture.

The years ahead although saw the purpose for which the fertilizers were introduced, soil health started to deteriorate due to the abuse and overuse of chemical fertilizers. The skewed C:N ratio and depleting levels of micronutrients in the soil manifested through multiple ways affecting productivity and yield. The significance of secondary nutrients and micronutrients came into picture and also the relevance of safeguarding the soil health. Fertilizer companies started to introduce fertilizers containing micronutrients and soil health enhancers. Although the trend is yet to catch up comprehensively across Indian farms, the changes have commenced. The country as such is in search of modes and means to enhance the per capita productivity with minimum resource use. Fertilizers still holds the potential to turn around the current system of farming. Innovation in products and product delivery can make a marked difference in Indian agriculture.

INDIAN FERTILIZER INDUSTRY OUTLOOK

The Indian Fertilizer Industry has shown tremendous growth in the last five decades and at present ranks third in the world. India is the second largest consumer of fertilizers after China. - India also ranks second in the production of nitrogenous fertilizers and third in phosphatic fertilizers, whereas the requirement



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of potash is met through imports since there are limited reserves of potash in the country.According to the Food and Agriculture report world demand for total fertilizer nutrients is estimated to grow at 1.8% per annum from 2014 to 2018. The demand for nitrogenous, phosphatic, and potash is forecasted to grow annually by 1.4%, 2.2%, and 2.6%, respectively, during the period. Over the next five years, the global capacity of fertilizer products, intermediates and raw materials will increase further. The global demand for nitrogenous fertilizers is expected to grow around 5.6% to 119.4MT in four years through 2018, according to the Food and Agriculture Organization of the United Nations. Asian nations, led by China and India, are expected to account for 58% of this increase.

Fertilizer sales, dependent on monsoon performance, this year registered a moderate increase. Total nutrient consumption (N+P2O5 + K2O) increased from a total of 25.95 million metric tonnes (million MT) during 2016-17 to 26.79 million MT during 2017-18. N consumption at 17.17 million MT, P2O5 at 6.84 million MT and K2O at 2.78 million MT recorded increase of 2.6%, 2.0% and 10.8%, respectively, during 2017-18 over the previous year. Per hectare use of total nutrients increased from 130.8 kg in 2016-17 to 135 kg during 2017-18. All-India NPK use ratio changed from 6.7:2.7:1 during 2016-17 to 6.2:2.5:1 during 2017- 18.

The production of total fertilizer nutrients (N+P2O5) showed a marginal increase of 1.2% in 2017-18 over 2016- 17. While the production of N at 13.42 million MT during 2017-18 registered a nominal increase of 0.3% over 2016-17, production of P2O5 at 4.72 million MT recorded an increase of 3.8% during the period. In terms of



product, production of Urea at 24.03 million MT and SSP at 3.91 million MT declined by 0.7% and 9.1%, respectively, during 2017-18 over 2016-17. In contrast, production of DAP at 4.65 million MT and NP/ NPKs at 8.24 million MT increased by 7.4% and 4%, respectively, during the period.

Supply of domestic gas to fertilizer plants declined for fourth consecutive year. Domestic gas supply declined from an average of 20.7 MMSCMD in 2016-17 to 18.1 MMSCMD in 2017-18. Share of domestic gas in total gas supply to fertilizer plants declined from 49.0% in 2016-17 to 42.8% in 2017-18. The balance requirement was fufilled by imported LNG. Increase in share of more expensive imported gas increased the pooled gas price for urea plants.

During 2017-18, import of urea and MOP increased significantly from the level of the previous year. Import of DAP and NP/NPKs, however, reduced during the period. Import of Urea, DAP, NP/NPKs and MOP was of the order of 5.98 million MT, 4.22 million MT, 0.50 million MT and 4.74 million MT, respectively,

during 2017-18.

Availability of fertilizers from opening stock at the beginning of the year, domestic production and imports was adequate to take care of demand for the full year. All-India stock of urea at various points was more than 2 million MT at the beginning of the year. Similarly, inventory of DAP and NP/NPKs together was about 1.5 million MT, SSP 0.56 million MT and MOP 0.54 million MT. In addition, large stocks were also lying with the dealers for which separate data are not available.

The basic retail price of Urea remained unchanged at Rs.5360 per tonne since November 2012. W.e.f. 25th May, 2015, Government of India made it mandatory for all indigenous urea manufacturers to produce 100% neem coated urea of their total urea production. The same policy is applied for imported urea at the port. Gol allowed the manufacturers/ importers to charge 5% extra on the MRP of urea. Therefore, the retail price of neem coated urea (excluding tax) works out to Rs. 5628 per tonne. The retail prices of P & K fertilizers covered under NBS scheme are market driven and announced by the fertilizer companies from time to time.

Most of the raw materials and feedstock for the fertilizer industry are imported. Due to constraints in the availability of gas in the country, which is the preferred feed stock for production of nitrogenous fertilizers, a near total dependence of the country on imported raw materials production of Phosphatic for fertilizers and full import dependence MOP, joint ventures have for become an important exercise of the Indian fertilizer companies. Existing joint ventures, namely Oman India Fertilizer Company (OMIFCO), Oman in Urea and Industries Chimiques du Senegal (ICS), Senegal and Indo-Maroc Phosphor (IMACID), Morocco in Phosphate have given the Country assured sources of supplies of Urea and Phos acid, a critical input for



production of Phosphatic fertilizers.

MICRONUTRIENTS ELUSIVE TO INDIAN SOILS

Micronutrient deficiency in soils are becoming a big issue in Indian agriculture. Although needed in small quantities, the impact they have on the plant health and yield is significant. With the dawn of green revolution era and the major emphasis being laid on primary nutrient fertilizers containing N,P and K, the micronutrient deficiency deepened. The study - conducted by the Indian Institute of Soil Science (IISS), a key research body of the Indian Council of Agricultural Research found that the soils of as many as 174 districts across 13 states were deficient in secondary nutrients like sulphur and micronutrients like zinc, boron, iron, manganese and copper. The chemical analysis of 70,759 soil samples collected from Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Madhya Pradesh, Maharashtra, Odisha, Punjab, Tamil Nadu, Uttar Pradesh, Uttarakhand and West Bengal found zinc to be deficient by 39.9 per cent and sulphur by 27.8 per cent. The boron deficit was found to be 20 per cent while iron, manganese and copper were deficient by 12.9, 6 and 4.3 per cent, respectively.

Zinc and iron pose critical nutritional issues as their deficiencies cause severe impairment of animal/ human health. In human nutrition, deficiencies of zinc and iron occupy 5th and 6th place, respectively among top ten leading causes of illness and diseases in low income countries. A systematic study on zinc in soil-plant-animal/human continuum has suggested a strong link of soil zinc status with grain/ seed zinc density and zinc levels in animal/human blood serum.The benefits of micronutrient application on foodgrain crops are enormous. Zinc fertilization alone has a potential of producing additional grains of worth more than Rupees 200 billion .

A variety of micronutrients carrying fertilisers are available in the country. These include 17 straight micronutrient fertilisers, 23 fortified fertilisers with zinc and boron, 30 crop- and area- specific customized fertilisers, 204 statespecific micronutrient mixtures, and a number of 100% water soluble mixtures of fertilisers with secondarv and micronutrients. Sulphate salts of zinc, iron, manganese and copper; borax and sodium/ammonium molvbdate are the major micronutrient carriers. Zinc sulphate (available both as hepta

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and monohydrate) consumption is maximum (188,300 tonnes in 2015-16) followed by 21,200 tonnes of iron sulphate and 20,000 tonnes of borax.

Encouraging the production and use fertilisers fortified with micronutrients is the ideal strategy to overcome the problem of micronutrient deficiencies in Indian soils.Inadequate extension and promotional activities continue to be the number one constraint in popularizing micronutrient use in India. Quality research, aggressive extension and promotional activities, and availability of quality products are below par. One of the reasons for the state of affairs is lack of conducive policy environment. A multipronged approach should include research, technology transfer through extension, sampling and testing facilities and pricing policies of the government to address the issues at hand. Better partnership among all the stakeholders i.e. scientists, industry, government and farmers is the need of hour to address the problem of micronutrient malnutrition soil-plant-animal in human system.

CULTIVATING THE ORGANIC WAY

The deteriorating soil health had steadily pointed towards our destructive form of soil management. The excessive reliance on chemicals for crop production and crop health managements left behind residues harmful to both environment and humans alike. This necessitates a rethinking of our methods of agriculture and many farmers decided to revisit our traditional methods of farming which involved less or no chemicals at all.

Commonly called as Organic farming, India is slowly opening to this chemical less method of cultivating crops. According to the World of Organic Agriculture Report 2018, India has the largest number of organic producers in the world. With over 835,000 certified organic producers, it is home to more than 30 percent of the total number of organic producers (2.7 million) in the world. Uganda (210,352) and Mexico (210,000) being the second and third largest organic producers, respectively. However, it has been observed that when it comes to the area under certified organic cultivation, India contributes only 2.59%, i.e., 1.5 million hectares of the total organic cultivation area of 57.8 million hectares. Thus, amongst the regions with the largest areas of organically managed agricultural land, India ranks 9th.

Several states in India are converting their farm lands to organic farms. Sikkim became the first organic state in the world with all its farmlands being certified organic. Sikkim was awarded UN Food and Agriculture Organisation's (FAO) Future Policy Gold Award (Gold Prize) for its achievement in becoming the world's first totally organic agriculture state. Mizoram has also passed the legislation to go fully organic by becoming the first in the country to legislate for turning its entire agricultural produce organic. It passed the Mizoram Organic Farming Act, 2004 on July 12, 2004. Many states such as Gujarat, Kerala, Karnataka, Andhra Pradesh, , Madhya Pradesh, Himachal Pradesh and Nagaland have come forward pledging their allegiance to organic cultivation.

However, there are several grey areas that need to be addressed to



FERTILIZER AND POLICIES

"The nutrient-based subsidy (NBS) scheme which was introduced by the Government on 1st April 2010 had the core objectives to contain fiscal subsidy which had increased dramatically after 2006-07 and to speed up balanced nutrition by balanced use of fertilizers to improve soil health i.e. improving the fast deteriorating NPK consumption ratios and promoting balanced nutrient consumption. NBS certainly did not lead to any decline in subsidy on fertilizer. It did, however, led to worsening of soil nutrient quality, along with shortages and price increase in all three types of urea, namely nitrogenous, phosphoric and potassic fertilizers. The subsidy on fertiliser, which was Rs.61,264 crore in 2009-10 immediately before the introduction of NBS, increased subsequently to Rs.72,969 crore, which has been budgeted for this fiscal (2015-16). & Rs.70079.85 crore for 2018-19 leading the government to rethink the subsidy model for fertilizers. Considering that fertilizer subsidy is the second-biggest subsidy after food subsidy, the inaction on the part of the government is not only affecting the fiscal health of the economy but is also upsetting the soil health of the country. Since fertilizer prices follow the trend in international petroleum prices, the only way to reduce the subsidy bill is to reduce the dependence on imports and increase domestic production. While rationalizing fertilizer subsidy across nutrients may be the short-term and immediate solution to the problem, the need of the hour is to have a policy framework that incentivizes domestic production of fertilizers. In nitrogen sector, Govt did take initiatives by revival of few plants eg Gorakhpur & Sindri of FCIL and HFCL, Ramagundam plant etc.& new capacities for company like Chambal. NBS Scheme could not improve Soil fertility as on one side we have urea available at Rs.5360 per tonne, whereas potash and phosphatefertilizers recently touched above Rs. 28000 per tonne.An undesirable outcome has been the change in fertilizer mix. As against the recommended Nitrogen (N): Phosphorous (P): Potassium (K)ratio of 4:2:1, the NPK ratio in 2013-14 was 8.2:3.2:1. After years of improvement in the NPK ratio, it had reached 4.3:2:1 in 2009-10, quite close to the recommended ratio. While the worsening of the NPK ratio at the all-India level is a matter of concern, the fact that this has reached alarming proportions in some states should be a cause for worry for the health of soil and nutrient content. its For example, NPK ratio in 2015 in Punjab 61.7:19.2:1; was in Haryana, it was 61.4:18.7:1; in Rajasthan, it was 44.9:16.5:1; and in Uttar Pradesh, it was 25.2:8.8:1.The



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deterioration in fertilizer mix will not only have an impact on productivity of crops but also on long-term soil health. No wonder, over the years, there has been a decline in the fertilizer response ratio.

Another important policy that had an impact on the fertilizer segment was the nationwide implementation of GST. The scheme implies value addition at each stage of production and supply chain with the set off benefits accruing from the producer's/service provider's point up to the retailer's level. The final consumer will thus bear only the GST charged at the last point of supply chain. Though there had been minor advantages & disadvantages, on a long term, it will definitely bring more transparency & will be in the best interest of all - customer or company. Also, it is really good that there had been periodic reviews & suitable modifications to make scheme more effective & efficient but at present it has 2 major implications.

1. The interstate movement of fertilizers from lower tax states to the higher tax states has almost stopped.

2. There is a significant pressure on Fertilizer companies for expensive working capital which eats away profitability due to long delays in reimbursement of GST input credits."

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make this movement successful. During the transition period, productivity on an average dips by 6.7 per cent in the first year, and the government needs to have a plan in place to support farmers during this period. To ensure marketing of organic produce, connecting farmers with the domestic and global supply chain is extremely important. The existing certification systems are not only cumbersome and timeconsuming, but also expensive. It is important to eliminate confusion over multiple certification systems and multiple ministries regulating organic production and sales.

POLICY SUPPORT

In India, the government keeps a close eye on the fertilizer sector. To an extent, the Fertilizer Industry is highly regulated and monitored by the Government of India. The government supports the farmers in the form of fertilizer subsidies. Except urea, all the decontrolled fertilizers are sold at MRP fixed by the manufacturers. Urea on the other hand enjoys subsidies.

Nutrient Based Subsidy (NBS)

policy was introduced by the Government to encourage the use of decontrolled fertilizers. W.e.f. from 1st April 2010, certain decontrolled fertilizers namely DAP, MAP, TSP, DAP Lite, MOP, SSP, Ammonium Sulphate and 15 grades of complex fertilizers are provided to the farmers at the subsidized rates based on the nutrients (N, P, K & S) contained in these fertilizers. Additional subsidy is also provided on the fertilizers fortified with secondarv and micronutrients as per the Fertilizer Control Order such as Boron and Zinc.

In 2015, New Urea Policy was introduced with the main purpose to ensure the maximum production of indigenous urea by promoting the use of energy efficient feedstock which will help rationalize and bring down the subsidy burden. The Union Government also subsidies the urea manufacturing units for the cost of transportation to facilitate the availability of urea at the same maximum retail price all over the country.

Recently the government has made it mandatory for all the urea

producers in country to produce 100% of their total production of subsidized urea as Neem Coated urea. Urea in this form has been found to increase crop yield. Neem coating of urea was introduced so it could save a substantial chunk of the Rs 55,000 crore subsidies given on urea fertilizer every year. Since NCU cannot be used for industrial purposes, illegal diversion of subsidized urea to non-agricultural use would not be possible. By curbing this illegal diversion of Urea for non-agricultural purposes, the government aims to prevent subsidy leakages as subsidized urea from India was also getting transported illegally to other nearby countries. This initiative has fostered rural employment amongst women who help in picking up the neem leaves and help in the production of the neem oil and neem cakes.

Gas Pooling for the Fertilizer (Urea) Sector would help provide natural gas at uniform delivered price to all Natural gas grid connected Urea manufacturing plants. The cost of gas, which is the most important component for production of urea,



varies from plant to plant owing to differential rates at which imported LNG is contracted as well as cost of transportation. The move would help bring down the cost of fuel. This move will help save about Rs. 1550 crores in subsidy and help urea manufacturing plants focus on their core business operations.

The introduction of Direct Transfers Benefit (DBT) was another reform that was long pending in the fertilizer sector. Under the DBT scheme, the subsidy will be released to the fertilizer companies instead of the beneficiaries, after the sale is made by the retailers to the beneficiaries. The DBT scheme should help curb the issues relating to diversion and smuggling of urea.

'Soil Health Card' scheme was also a landmark reform that was introduced in the Indian agricultural scene. According to the scheme, Soil Health Card with information on macronutrients and micronutrients will be generated for all the 14 crore landholdings in a cycle of 3 years. Besides, it also provides an advisory on soil test based use of fertilisers and amendments. Uniform soil sampling procedure will be adopted by the State for rainfed and irrigated areas. The scheme will provide assistance to State Governments to issue soil health cards periodically every 3 years, to all farmers of the country, so as to ensure that farmers apply the required amount of nutrients to their crops. Soil Health Card data can always be cross-checked with the Geo-referenced points used for preparation of soil fertility maps.

INDUSTRY WOES

Subsidies have always remained a bone of contention between the government and the fertilizer Industry. The industry has felt that the budget allocations was less this year and the unpaid subsidy dues carried forward from one year to the other has added to their woes. Unpaid subsidy at the end of 2017-18 was estimated to be Rs.32,053.21crore.

Indian urea sector, on the other hand, has continued to suffer from non-payment of increased fixed cost, unreasonable reduction in energy consumption norms, unfavourable policy for production beyond 100% of re-assessed capacity and discriminatory policies for naphtha based plants.

The industry voices concerns on some of the issues of P & K sector which need to be addressed that includes, i) to dispense with furnishing of half yearly cost data, ii) to notify criteria for reasonable MRP and iii) higher import duty on raw materials compared to finished fertilizers. The major issue of SSP industry which remains unaddressed



is non recognition of freight subsidy. There is need for either merging freight with product subsidy under NBS as per the approval of CCEA or making provision of freight subsidy for SSP industry as well.

Another major issue raised by the industry is regarding the GST on fertilizers and raw materials that was implemented from 1st July, 2017. GST rate on finished fertilizers was brought down at 5% from initially announced 12%. Following several representations by the industry and follow up, rates for phosphoric acid and sulphur were also reduced to 5%. However, rates of GST for naphtha, ammonia and sulphuric acid still remain at 18%. Rate of IGST on imported urea and MOP for manufacture of complex fertilizers was attracting 18%. GST council has clarified that the fertilizer supplied for use in the manufacturing of complex fertilizers for agricultural use will attract 5% IGST w.e.f 27th Julv, 2018.

Government of India rolled out the DBT scheme for fertilizers in all states between 1st September, 2017 and 1st March, 2018. But under the DBT scheme for fertilizer sector, subsidy is not transferred directly into the accounts of the beneficiaries as is done in case of LPG. Fertilizer subsidy continues to be routed through the industry. Entitlement of subsidy takes place after sales are made by the retailers through the POS machine. However, there are several policy and operational issues in regard to implementation of DBT for fertilizer sector which are delaying or even denying subsidy on products sold under new scheme. This also requires further clarity.

Fertilizers are important for the sustenance of agriculture. However, guidance should be provided to farmers regarding the quantity and the time of application. Soil health should be the focus and fertilizers used must add to the soil health. Sustainability conservation and of resources should be the cornerstone of any future agriculture interventions.

'There is no life without Zinc'

The International Zinc Association (IZA), created in 1991 by a group of leading zinc producers, is guided by the principle of undertaking actions that positively influence the market and image of zinc. The Association's primary goal is to deliver value to its Members through innovative programs in its strategic focus areas of Environment and Sustainable Development, Technology and Market Development and Communications. IZA provides a forum for the zinc industry to analyze and anticipate issues affecting zinc globally and to ensure a timely and appropriate response. IZA coordinates



initiatives good for zinc that are best done collectively, undertaken either directly or through involvement and support of customer groups and related stakeholders on the local, regional and global levels. In an interview with Agriculture Today, Dr. Soumitra Das, Director, South Asia - Zinc Nutrient Initiative, International Zinc Association discusses the relevance of zinc in agriculture and how their inclusion can increase the plant and human health.

What is the role of micronutrients in enhancing crop yield?

As we are aware, micronutrients are essential for crop growth and development and play an important role in balanced crop nutrition. They include eight essential elements, namely, zinc (Zn), boron (B), iron (Fe), manganese (Mn), copper (Cu), molybdenum (Mo), chloride (Cl) and nickel (Ni).It is not that the micronutrients are less important than the macronutrients to crop nutrition, but they are needed in small (micro) quantities by the crops, and hence known as micronutrients.

What role does zinc play in plant and human nutrition?

Zinc plays many vital roles in plants as well as human beings. In plants, it plays a key role as a structural constituent or regulatory co-factor of a wide range of different enzymes and proteins in many important biochemical pathways. These are mainly concerned with carbohydrate metabolism, both in photosynthesis and in the conversion of sugars to starch, protein metabolism, auxin (growth regulator) metabolism, pollen formation, maintenance of the integrity of biological membranes and resistance to infection by certain pathogens. Zinc in balanced fertilizer use ensures better yield and quality of crops.

Zinc is vital for many biological functions in the human body. The adult body contains 2-3 grams of zinc. It is present in all parts of the body, including: organs, tissues, bones, fluids and cells. It is vital for more than 300 enzymes in the human body, activating growth - height, weight and bone development, growth and cell division, immune system, fertility, taste, smell and appetite, skin, hair and nails, vision. Some of the reported symptoms due to zinc deficiency in humans, especially in infants and young children, are diarrhoea, pneumonia, stunted growth, weak immune system, retarded mental growth and dwarfism, impaired cognitive function, behavioural problems, memory impairment, problems with spatial learning, and neuronal atrophy.

How significant is the link between zinc deficient soils and malnutrition?

There is no life without zinc. Zinc is an essential nutrient for human health. There is a high degree of correlation between zinc deficiency in soils and that in human beings. It is estimated that about one-third of the world's population suffers from



Deaths from diarrhea and pneumonia in children under five (Source: UNICEF, 2012)

zinc deficiency. Recently, zinc deficiency - especially in infants and young children under five years of age - has received global attention. Zinc deficiency is the fifth leading cause of death and disease in the developing world. According to the World Health Organization (WHO), about 800,000 people die annually due to zinc deficiency, of which 450,000 are children under the age of five.

The widespread zinc deficiency has led to zinc malnutrition in the humans, especially in the developing nations, like India. The country-wise deaths from diarrhoea and pneumonia in children under five depicts that the casualty due to zinc deficiency in India is alarmingly high, even higher than the Sub-Saharan African countries or the neighbouring countries. This has drawn the attention of the government and policy makers in India and generated the awareness on the critical role of zinc in human health.

Are you satisfied with the government's policies and approach in identifying the micronutrient deficiency and particularly zinc deficiency in Indian soils?

India's fertilizer policies are mainly skewed towards the primary nutrients, NPK. But, under the Nutrient Based Subsidy (NBS) Scheme, the role of micronutrients, specially, zinc and boron has been specially targeted through additional subsidy for fortification. In addition, the Government of India is promoting the use of micronutrients under the National Food Security Mission (NFSM). Nevertheless, it is continued to be a major disappointment that GST rates on micronutrient fertilizers have been levied at 12% or higher, whereas the bulk fertilizers are enjoying a reduced rates of 5%, discouraging the farming community to practice balanced fertilizer use in the country. In addition, the pricing policy of the Zincated-Urea should be approved by the Government, which has been already included in the Fertiliser Control Order (FCO) way back in 1990s, but due to a minor price disparity, it is not being produced or marketed by the fertilizer industry in India. It is also expected from the Government that Urea, which is at present out of the gambit of NBS Scheme, should be considered to include in the same, so as to encourage the balanced fertilizer use. What to talk about the micronutrients, even the nutrient ratio within NPK is highly distorted due to price disparity!

What are the immediate measures that you want to see to address this problem?

I would like to flag here the key policy measures to address the challenges in popularizing micronutrients, specially zinc in balanced fertilizer use:

- GST rates on micronutrients should be reduced and made at par with the bulk / NPK fertilizers at 5%.
- Zincated Urea pricing policy should be approved by the Government
- Urea should be included in the gambit of Nutrient Based Subsidy Scheme.

Is India equipped to deal with zinc deficiency in soils?

If we look at the trend of zinc fertilizer consumption in India, there is a significant increase, more than 50% in consumption in the last a couple of years. The latest report released by the ICAR - AICRP on Micronutrients says that the zinc deficiency in soils in India has improved from 48.8 to 36.5% today. This could be mainly attributed to the increased use of zinc fertilizers, as a result of increased demand of zinc fertilizers due to increased awareness level of the stakeholders, specially the farmers in India. India is, therefore, fully equipped to deal with zinc deficiency in soils, animals and humans, if well supported by the micronutrient fertilizer policy of the Government.

Are there any organic fertilizers that can address the problem of zinc deficiency?

In fact, almost every organic sources of plant nutrients, like FYM, compost, vermicompost etc. are having micronutrients, may be in trace amount. Hence, it is strongly recommended that the farmers should practice integrated nutrient management, including organic, mineral and biological sources of plant nutrients to address the problem of micronutrient deficiency. I am sure, the Government of India will take a favourable policy decision to encourage the farmers in practising balanced fertilizer use, after the success of the 'Soil Health Card Scheme', to realise the bigger dream of the Hon'ble Prime Minister, Shri Narendra Modi's 'Doubling Farmers Income by 2022'.

Faba bean *(Vicia faba L.):* An Alternative Pulse Crop for Indian agriculture



ince the early ages of agriculture, the leguminous crops have remained an integral and essential part of the human diet and have played an important role in diet diversification of people around the world. Many legume species are irreplaceable sources of dietary proteins for humans directly or indirectly. They have been agents of diversification of agricultural production systems since time immemorial and have heavily contributed to the sustainability of these systems. Leguminous crops are natural nitrogen fixers and thus help in minimizing the soil and environmental degradation by reducing the use of chemical nitrogen fertilizers in commercial agricultural production systems. The sustainable developmental goals involving poverty reduction, human health improvement and enhancing ecosystem resilience



Pod clusters on a faba bean plant

can be ideally addressed by laying more emphasis on cultivation of leguminous crops. As a source of dietary protein,these legumes become increasingly important especially in developing countries like India where a significant proportion of the population is vegetarian. The importance becomes manifold when another significant proportion of the population mainly of the third



A single pod

world countries finds itself unable to afford animal source of dietary protein due to widespread poverty. Protein malnutrition in growing children is a major health concern in India which is expected to increase as the

availability of protein to the rapidly growing population is speculated to take the form of a bigger challenge in the coming future. Under this scenario, grain legumes, which are rich in essential amino acids, are affordable and easily available alternatives of animal products as source of protein.

As far as production of pulses is concerned, India holds a very unique place in that the country is the largest producer, consumer and importer in the world. Pulses as a whole constitutes approximately 7-10 percent of the total food grain production of India, however, the area under pulses ranges to the tune of 20 percent of the total area under food grains, reflecting the poor productivity of the pulses production systems. Chickpea, pigeonpea, green gram, black gram, horse gram etc are major pulse crops of India which are grown in various agro-ecological climates in different seasons. These pulse crops suffer from low realized yield and their sensitivity to a variety of biotic and abiotic stresses. Therefore, a need for an environmental hardy pulse crop of high productivity and suitability to Indian growing conditions has been lately felt. Faba bean has been proposed to be one such potential pulse crop particularly for regions characterized by poor soils and abiotic stresses. Belonging to the family fabaceae, Faba bean, is also known as broad bean has a long history of cultivation in the human civilization. It is anannual diploid plant and can be easily raised as a main pulse crop during the Rabi season in India. Faba bean is one of the earliest domesticated plants which is believed to be domesticated during the Neolithic period. It is an important global pulse, fodder crop and vegetable throughout the temperate world and at higher altitudes in some sub-tropical regions.lt is world's fourth most important legume crop after pea, chickpea and lentil, widely cultivated for human food, animal feed and fodder. It is also used as a cover



crop in many regions of the world. Faba bean plays an important role in world agriculture because of its high seed protein content which ranges from 20 to 40% depending upon the genotype and the environmental conditions in which it has been grown. It is an efficient nitrogen fixer and improves soil fertility through symbiotic nitrogen fixation. It can arow well on high fertility soil to N-deficient marginal lands. Faba bean can withstand salinity conditions, especially chloride and sulphate salts to a greater extent than chickpea and unlike chickpea it thrives well under irrigated conditions. It has a potential yield of 60-75 quintals per hectare with an average yield of 40-45 guintals per hectare.

Faba bean has been recognized as a potential grain legume by the Indian National Agricultural Research System and has been included in the All India Coordinated Research Network on Potential crops. It has also been identified as one of the eight major food legumes by the CGIAR research programme for priority focus and continuously gaining importance as a grain legume for protein security of demographically expanding and climatically changing world.

In China, Ethiopia, the Middle-East and the Mediterranean, faba bean is used as a breakfast food as soup, stews and paste made by grinding etc. In India, the green unripe pods of faba bean are mainly cooked and eaten as vegetable. Apart from being a staple human food in many developing countries, faba bean is also used to feed animals such as pigs, horses, poultry and pigeons in industrialized countries. It is grown in rotation with cereal crops for improving soil physical condition, breaking disease cycles and controlling weeds. Moreover, faba bean has the potential to be developed as a functional food crop for the patients of the Parkinson's disease which is world's second most important neurodegenerative disorder caused by insufficient synthesis of the neurotransmitter dopamine. The young pods and the leaves of faba bean have been reported to be the most practical means for the direct intake of the L-DOPA (L-3, 4-dihydroxy phenylalanine) which serves as a precursor of dopamine.

However, the quality-limiting anti-nutritional factors, such as vicine, convicin, tannins and phenolic compounds compromise the value of



faba bean in human diets. Vicine and convicine are stored in the cotyledons and are harmful for humans carrying a genetic defect glucose- 6-phosphate dehydrogenase (G6PDH) deficiency. The medical condition involves hemolytic anemia and it has been termed as favism. Given the high prevalence of Glucose-6-phosphate dehydrogenase (G6PD) deficiency (upto 27%) particularly in tribal population, the vicine and convicine content need to be significantly lowered before the crop can be popularized in India. Alternatively varieties with lower or nil percentage of these anti-nutritional factors need to be developed for large scale popularization and adoption.

At present faba bean is cultivated in more than 50 countries of the world. The world production of faba bean was 3.4 million metric tonnes in the year 2013. The major faba bean growing countries are China (1.65 Mt), Ethiopia (0.61Mt), France (0.44 Mt), Egypt (0.29 Mt) and Australia (0.19 Mt). China is the leading producer with 43% share of the world's total faba bean production. However, in spite of the increasing importance as a food, feed and fodder crop, the world area under faba bean cultivation has declined from 5 million hectares in 1965 to less than half in 2007. The reasons attributed to this decrease in area are unstable yields,

inability to exploit heterosis in yield by developing hybrid varieties and biotic and abiotic stresses causing drastic yield losses.

Faba bean was introduced into India through Mesopotamia probably after the advent of the Arabian spice trade route which came in to existence around 3000B.P. It is called Baglaor Bakla in Hindi and its subsidiary dialects in India which are also the Arabic and Turkish names for faba bean. These names are indicative of its Arabian route of entry into India. Since its introduction it has become a traditional legume crop in the Bihar state of India. It is also grown on small scale in Jharkhand, Eastern Uttar Pradesh, Chhatisgarh, Odisha and Madhya Pradesh. The area and production statistics are, however, not available and neither are there any trade reports or market or prices reports. It is mainly cultivated in rabi season for its green pods which are used as vegetable and no traditional food use for its seeds has been reported. The pods are easily available in the vegetable markets of these states and elsewhere also.

Despite the huge importance of faba bean as a protein source for humans and animals in ensuring food and nutritional security in context of global population increase and global climate change, its full potential through hybrid breeding remains unexploited largely due to its unique pollination biology and yield instability. At present there are five commercial cultivars available in India. Pusa Sumit and Pusa Udit developed at the Indian Agricultural Research Institute, New Delhi, Swaran Gaurav and Swarna Safal developed by ICAR-Research Complex for Eastern Region, Patna and Vikrant developed by CCS Agricultural University, Haryana Hisar. The characteristic features of variety Vikrant are medium seed size, medium yield, resistant to diseases and salinity and low pod shattering.

Faba bean suffers from some major drawbacks as a crop. These are yield instability, lower realized yields, lodging, asynchronous maturity, pod shattering at maturity etc. To remove these defects either completely or partially are the major breeding objectives of the faba bean improvement programmes the world over along with incorporation of resistance against drought, frost, fungi and other pathogens and pests. The improvement in seed yield and vield stability need to be addressed through the component traits.

Qualitatively, improvement in the grain quality in the form of increase in protein content and removal of anti-nutritional factors constitute the major breeding objectives in faba bean. In conclusion, the adaptive advantages associated with this hardy and versatile pulse crop need to be exploited on large scale in Indian context and the crop need to be popularized primarily in areas where traditional pulse crops perform poorly or the marginal areas. Faba bean in such areas may prove a boon for the deprived resource poor farming community and can effectively and substantially contribute towards achieving the national objective of doubling the farmer's income by 2022.

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DRONES TO PLAY A MAJOR ROLE IN SCALING AGRICULTURAL PRODUCTION

he traditional way of agriculture will soon be history. Today, robotics, data analytics, and Internet of Things (IoT) for agricultural sector is paving newer ways for a promising future, resulting in greater yields with lesser inputs. Precisely, precision agricultural technology is the future. With the world population being projected to reach a whopping 9 billion by 2050 and with demand from agriculture expanding manifold, precision agricultural technology is probably the only solution for boosting productivity to feed all mouths.

Among the various precision agricultural technologies, drones make a very prominent cut.While we normally associate drones with the ones we see at weddings, bigticket corporate and cultural events and even in political funerals, mainly used for photography, drone technology with its powerful telematics capability can be adapted to create multiple solutions across sectors including agriculture, mining, and defense.

Adoption of drone technology in agriculture can ease the process of production, boosting productivity. For example, data on precise crop health can be monitored and recorded regularly using drones. Intervention can be done, as and when required, ensuring better production. This can also help in fulfilling India's cherished vision of 'more crop per drop', in days to come.

Similarly, drones can be leveraged across the cropping cycle from seeding to harvesting, to surveying the fields, mapping weeds, estimating yield and soil variation. This helps in precise application of pesticides, fertilizers etc., thus improving productivity at large and also helping in cost saving. Again, the use of Drone technology for crop insurance surveys could be a major game changer in making the Pradhan Mantri Fasal Bima Yojana (PMFBY) an effective scheme at the ground level.Recently, a committee tasked by the government's apex planning body with studying how drones can be used in crop insurance schemes has suggested drones as the best option to monitor crops.

Drones can provide timely and precise information of field level scenarios, there-by benefiting the farmer to take informed decisions as well as support in the event of loss on account of natural factors like floods, drought and similar calamities.

Another example of using drone technology in agriculture is by adapting telematics and creating smart tractors with GPS controlled steering and optimized route planning, that are capable of reducing soil erosion and saving fuel cost.

Agribots- a major adaptation of drones, are making way for a smart future of agriculture in India. A herd of these specialized agribots are capable of cropping, weeding, fertilizing and harvesting, as and when needed. These robots are also capable of microdot application of fertilizer, thus reducing the cost on fertilizers.

Precision agricultural technology, with drone technology in particular, is all set to guide the agricultural sector towards opportunities of the future, with a considerable boost to the quality and quantity of production, at a reduced cost of investment.

Sai Pattabiram, Founder and CEO of Shree Sai Aerotech Innovations Pvt Ltd and Zuppa, 'the only made in India' drone

MODERN FARMING ORGANIC AGRICUTURE

he growth of organic agriculture in India has three dimensions and is being adopted by farmers for different reasons. First category of organic farmers are those who are situated in no-input or low-input use zones, for them organic is a way of life and they are doing it as a tradition (may be under compulsion in the absence of resources needed for conventional high input intensive agriculture). Second category of farmers are those who have recently adopted organic agriculture in the wake of ill effects of conventional agriculture, may be in the form of reduced soil fertility, food toxicity or increasing cost and diminishing returns. The third category comprises of farmers and enterprises who have systematically adopted the commercial organic agriculture to capture emerging market opportunities and premium prices. While majority of farmers in first category are traditional (or by default) organic, they are not certified. Second category farmers comprises of both certified and un-certified, but majority of third category farmers are certified. It is the third category commercial farmers who are attracting the most attention. The entire data available on organic agriculture today, relates to





these commercial organic farmers.

Organic farming is one of the several approaches found to meet the objectives of sustainable agriculture. Many techniques used in organic farming like inter-cropping, mulching and integration of crops and livestock are not alien to various agriculture systems including the traditional agriculture practised in old countries like India. However, organic farming is based on various laws and certification programmes, which prohibit the use of almost all synthetic inputs, and health of the soil is recognized as the central theme of the method.

Adverse effects of modern agricultural practices not only affects the farm but also the health of all living things and thus on the environment. Incidents of the same have been well documented all over the world. Application of technology, particularly in terms of the use of chemical fertilizers and pesticides all around us, has persuaded people to think aloud. Their negative effects on the environment are manifested through soil erosion, water shortages, salination, soil contamination, genetic erosion, etc.

NUTRIENT MANAGEMENT IN ORGANIC FARMING

Organic farming is often understood as a form of agriculture which uses only organic inputs for the supply of nutrients and management of pests and diseases. In fact, it is a specialized form of diversified agriculture, where

in problems of farming are managed using local resources alone. The term organic does not explicitly mean the type of inputs used; rather it refers to the concept of farm as an organism.Often, organic agriculture has been criticized on the grounds that with organic inputs alone, farm productivity and profitability might not be improved because the availability of organic sources is highly restricted. True, organic resources availability is limited; but under conditions of soil constraints and climate vagaries, use of organic inputs use has proved more profitable compared to agrochemicals.

Organic farming systems rely on the management of soil organic matter to enhance the chemical, biological and physical properties of the soil. One of the basic principles of soil fertility management in organic systems is that plant nutrition depends on 'biologically-derived nutrients' instead of using readily soluble forms of nutrients; less available forms of nutrients such as those in bulky organic materials. This requires release of nutrients to the plant via the activity of soil microbes and soil animals. Improved soil biological activity is also known to play a key role in suppressing weeds, pests and diseases. Animal dung, crop residues, green manure, biofertilizers and bio-solids from agro-industries and food processing wastes are some of the potential sources of nutrients of organic farming. While animal dung has competitive uses as

fuel, it is extensively used in the form of farmvard manure. Development of several compost production technologies like vermin composting, phosphor composting, N-enriched phosphor composting, etc. improves the quality of composts through enrichment with nutrient-bearing minerals and other additives. These manures have the capacity to fulfil nutrient demand of crops adequately and promote the activity of beneficial macro- and micro-flora in the soil. There are several doubts in the minds of not only farmers, but also scientists about whether it is possible to supply minimum required nutrients the to crops through organic sources alone. Even if it is possible, how are we going to mobilize the organic matter? At this juncture, it is neither advisable nor feasible to recommend the switchover from fertilizer use to organic manure under all agroecosystems.Presently,only 30% of our total cultivable areas has irrigation facilities where agrochemicals use is higher compared to rain-fed zones. It is here that ingenuity and efforts are required to increase crop productivity and farm production despite recurrence of environmental constraints of drought and water scarcity.

The basic requirement in organic farming is to increase input use efficiency at each step of the farm operations.This is achieved partly through reducing losses and adoption of new technologies for enrichment of nutrient content in manure.



Technologies to enrich the nutrient supply potential from manure, including farmyard manure, to three to four times are being widely used in organic farms. According to a conservative estimate, around 600 to 700 million tonnes (mt)of agricultural waste is available in the country every year, but most of it is not used properly. We must convert our filth into wealth by mobilizing all the biomass in the rural and urban areas into bioenergy to supply required nutrients to our starved soil and fuel to farmers. India produces about 1800 mt of animal dung per annum. Even if two-thirds of the dung is used for biogas generation, it is expected to yield biogas not less than 120 m m³ per day. In addition, the manure produced would be about 440 mt per year, which is equivalent to 2.90 mt N, 2.75 mt P²O⁵ and 1.89 mt K²O.

Organic farms and food production systems are quite distinct from conventional farms in terms of nutrient management strategies. Organic systems adopt management options with the primary aim to develop whole farms, like a living organism with balanced growth, in both crops and livestock holding. Thus nutrient cycle is closed as far as possible. Only nutrients in the form Only nutrients in the form of food are exported out of the farm. Crop residues burning is prohibited; so also the unscientific storage of animal wastes and its application in the fields. It is, therefore, considered more environment friendly and sustainable than the conventional system

of food are exported out of the farm. Crop residues burning is prohibited; so alsot he unscientific storage of animal wastes and its applicationin the fields. It is, therefore, considered more environment friendly and sustainable than the conventional system. Farm conversion from highinput, chemical-based system to organic system is designed after undertaking a constraint analysis for the farm with the primary aim to take advantage of local conditions and their interactions with farm activities, climate, soil and environment, so as to achieve(as far as possible) closed nutrient cycles with less dependence

on off-farm inputs. This implies that the only nutrients leaving the farm unit are those for human consumption. Crop rotations and varieties are selected to suit local conditions having the potential to sufficiently balance the nitrogen demand of crops. Requirements for phosphorus, sulphur and micronutrients are met with local, preferably renewable resources. Organic agriculture is, therefore, often termed as knowledge-based rather than input-based agriculture. Furthermore, organic farms aim to optimize the crop productivity under a given set of farm conditions. This is in contrast to concept of yield maximization through the intensive use of agrochemicals, irrigation water and other off-farm inputs. There are ample evidences to show that agrochemical-based, high-input agriculture is not sustainable for long periods due to gradual decline in factor productivity, with adverse impact on soil health and quality.

ENVIRONMENTAL BENEFITS OF ORGANIC AGRICULTURE

The impact of organic agriculture on natural resources favours interactions within the agro-ecosystem that are vital for both agricultural production and nature conservation.



Ecological services derived include soil forming and conditioning, soil stabilization, waste recycling, carbon sequestration, nutrient cvclina, predation, pollination and habitats. The environmental costs of conventional agriculture are substantial, and the evidence for significant environmental amelioration via conversion to organic agriculture is overwhelming. Δ review of over 300 published reports showed that out of 18 environmental impact indicators(floral diversity, faunal diversity, habitat diversity, landscape, soil organic matter, soil biological activity, soilstructure, soil erosion, nitrate leaching, pesticide residues, CO², N²O, CH⁴, NH³, nutrient use, water use and energy use),organic farming systems performed significantly better in 12 and performed worse in none. There are also high consumer human health costs to conventional agriculture, particularly in the use of pesticides. It is estimated that 25 million agricultural workers in developing countries are poisoned each year by pesticides.

FUTURE PROSPECTS

Although, commercial organic agriculture with its rigorous quality assurance system is a new market controlled. consumer-centric agriculture system world over, but it has grown almost 25-30% per year during last 10 years. In spite of recession fears the growth of organic is going unaffected. The movement started with developed world and gradually picking up in developing countries. But demand is still concentrated in developed and most affluent countries. Local demand for organic food is growing.

India is poised for faster growth with growing domestic market. Success of organic movement in India depends upon the growth of its own domestic markets. India has traditionally been a country of organic agriculture, but the growth of modern scientific, input intensive agriculture has pushed it to wall. But with the increasing awareness about the safety and quality of foods, long term sustainability of the system and accumulating evidences of being equally productive, the organic farming has emerged as an alternative system of farming which not only address the quality and sustainability concerns, but also ensures a debt free, profitable livelihood option.

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INCULCATE THE BENEFITS OF CLIMATE SMART AGRICULTURE THROUGH ADVISORY SERVICES AMONG FARMERS



griculture in developing countries ao through significant transformation needed to meet the growing and interconnected challenges of food insecurity and climate change. It is one of the major threats to humankind and affects many sectors like forestry, agriculture, environment and human lives as well. Climate change has brought about severe and possibly permanent alterations to our planet's geological, biological and ecological systems. The croplands, pastures and forests that occupy approximately 60 per cent of the earth's surface are progressively being exposed to threats from increased climatic variability. Agricultural contribution in world's economy from last six years i.e. 2011-2016 indicates that agriculture's contribution to world's GDP has decreased annually except in 2012 where it contributed to 4.94 per cent to the world's economy. There is also the declining trend of agricultural and allied activities' share in total Indian GDP. Several reasons have been reported for this declining trend of annual GDP growth in both world and Indian economy, i.e. decreased land holdings, green revolution, declined ground water availability, irregular finance and market conditions, climate change and weather



World's GDP annual Growth



variability, etc.

One of the above factors i.e., changes in climatic conditions and weather variability plays an important role in ensuring food security of the world and Indian economy. Agriculture and allied sectors are found to be most sensitive to climate change and any degree of change in weather parameters, i.e. temperature, rainfall and relative humidity pose a significant impact on agricultural and allied sectors' productivity which is an important measure of food security of the nation. Food security is linked both directly and indirectly to climate change. So CSA is an important approach in agriculture to cope up with the most challenging issue of the world. Much research has been conducted on the biophysical aspect of climate change but socio-economic research regarding the impact of these CSA practices is particularly lacking. So there is a need of strong extension network in climate-smart agriculture for transfer of technology and changing the behaviour of farmers or to provide them with different location specific adaptation and mitigation strategies.

CLIMATE CHANGE AND AGRICULTURE

In addition to food and raw materials, agriculture also provides employment

Agriculture contributes to approximately 14% to India's GDP.In India, significant negative impacts have been implied with medium-term (2010-2039) climate change, predicted to reduce yields by 4.5-9%, depending on the magnitude and distribution of warming

opportunities to large population. Climate change directly affects agricultural production as this sector is inherently sensitive to climatic conditions and is one of the most vulnerable sectors at risk and impact of global climate change. Climate change is projected to have significant impacts on conditions affecting agriculture, including temperature, carbon dioxide, glacial run-off, precipitation and interaction of these elements. These conditions determine the carrying capacity of the biosphere to produce enough food for the human population and domesticated animals. The overall effect of climate change on agriculture depends on the various measures adopted to balance these effects.

IMPACT OF CLIMATE CHANGE ON WORLD AGRICULTURE

Climate change has direct impact on food production across the globe. Overall, agricultural productivity for the entire world is projected to decline between 3 and 16 % by 2080s. Developing countries, many of which have an average temperature that is already near or above crop tolerance levels, are predicted to suffer an average 10 to 25% decline in agricultural productivity by 2080s. The most affected areas from climate change are economically vulnerable countries, already food insecure and some important food exporting countries. Consequently, climate change is expected to increase the gap between developed and developing countries as a result of more severe impacts on already vulnerable developing regions, exacerbated by their relatively lower technical and economical capacity to respond to new threats. According to the International Food Policy Research Institute (IFPRI), it will cause an increase of between 8.5 and 10.3% in the number of malnourished children in all developing countries, relative to scenarios without climate change.

AGRICULTURE AND CLIMATE CHANGE - INDIAN SCENARIO

India is an agriculture dependent country and more than two-third of its population depends on agriculture for their survival. Agriculture contributes to approximately 14% to India's GDP.In India, significant negative impacts have been implied with medium-term (2010-2039) climate change, predicted to reduce yields by 4.5-9%, depending on the magnitude and distribution of warming. Since agriculture makes up roughly 16% of India's GDP 4.5-9% negative impact on production implies a cost of climate change to be roughly up to 1.5% of GDP per year. People and their livelihood are directly or indirectly affected by climate change. Climate change poses a direct and growing threat to the livelihoods of millions

of people in India.According to a study done by the Indian Agricultural Research Institute, it was found that there is the possibility of loss of 4–5 million tonnes in wheat production in future with every rise of 1°C temperature throughout the growing period. Rice production is slated to decrease by almost a tonne/hectare,if the temperature goes up by 2°C. In Rajasthan, a 2°C rise in temperature was estimated to reduce production of pearl millet by 10-15%.

CLIMATE INFORMATION SERVICES

Reducing vulnerability to climate risks in the present scenario is necessary for adapting to climate change in the future, as vulnerable farmers experience climate change largely as shifts in the frequency and severity of extreme events. In risk-prone environments, efforts to foster the transition towards more productive and resilient agricultural livelihoods must therefore be supported by strategies, programmes and policies that enable vulnerable populations to overcome the obstacle of climate risk. With enabling institutional support and policies, value-added climate information and advisories reduce this uncertainty, and enable farmers to better manage risk, take advantage of favourable climate conditions, and adapt to change. Different forms of climate information helps farmers to



make informed farming decisions. As we know, extension is the main discipline which directly deals with the farmers to give them information or enhance their capacity to increase their productivity, so that they adapt to climate change. So there is an emergence of some extension methods which helps the farmers to fight against climate change. Availability of adaptation or mitigation technologies is not sufficient for farmers unless they are aware about climate change consequences and are ready to fight them. So here extension plays a major role in the changing climate scenario by providing them climate-smart information at the right time.

CLIMATE SMART AGRICULTURE WITH RURAL ADVISORY SERVICES

Rural Advisory Services (RAS)

contribute to achieving climate-smart agriculture (CSA) by disseminating climate information and technologies and information on production practices for climate adaptation through innovative approaches, such as plant clinics and participatory video. Extension reflects a major part in supporting CSA through the following: technology development information dissemination, and strengthening farmers' capacity, facilitation and brokering, and advocacy and policy support. RAS have a comparative advantage in these functions and are already actively engaged in these roles more broadly to improve their effectiveness. CSA also will require capacity development at individual and organisational level and institutional reform at the systems level.At present RAS providers in many countries have been supporting



agricultural innovation systems (AIS) by playing various roles in the establishment of multi-stakeholder innovation platforms. The innovation process brings the actors together, functioning as a bridging organisation facilitating interaction between actors, coordinating and creating networks, supporting facilitating actors access to information, knowledge expertise, and providing and technical backstopping. Extension providers can help in mitigation by strengthening farmer groups and rural organisations and linking them to voluntary a regulated carbon markets and supporting payment for ecosystem services programs. Besides strengthening existing linkages between farmers and their conventional partners rural advisers can also facilitate engagements with new types of institutions related to climate change, such as insurance companies, humanitarian agencies and meteorological services.RAS are uniquely placed to highlight the outcomes of climate-related events to policymakers and advocate for policy change and investment in CSA. Enlisting farmers, pastoralists and others directly affected by the changing climate as spokespeople to put a human face to the problem, highlighting potential solutions and providing feedback on policies and progress are some ways RAS can contribute to keeping climate change and CSA high on the policy agenda.

EXTENSION APPROACHES USED IN CLIMATE SMART AGRICULTURE (CSA)

While lack of location-specific tools, long term experiences and a favourable enabling environment are barriers to CSA implementation, there are a number of climate-smart technologies and practices that are known and available. Extension services were traditionally conceived as the mechanism to put researchbased knowledge into use with a strong focus on increasing agricultural production. Today, extension comes



in many sizes and shapes and a distinction between the extension approaches such as participatory training approach, training and visit approach or the main underlying principles of the advice is not absolute. However, all extension systems share the common challenge of how to best respond to climate change. There are several ways that extension systems can contribute to CSA.

- Climate Awareness programmes/ Campaigns, Exhibitions
- Climate Trainings
- Climate workshops
- Plant health Rallies
- Climate Farmers field schools
- Field visits to progressive farmers
- Demonstration on different adaptation or mitigation practices
- ICT-supported network
- Participatory crop planning
- Climate-smart village

INNOVATIVE EXTENSION APPROACHES AND METHODS FOR CLIMATE-SMART AGRICULTURE

Promotion of FIGs was done to organise them in a group on the basis of their commodity or enterprise because it is easy for dissemination of information. Training was also given to the youths or farmers of the village on how to read data from automated weather station or how to read temperature or how to predict that information. Informative Crop Calendar is a type of calendar which provides all agricultural practices package of the crops such as Climate Trainings, Climate Workshops, Field Demonstration and Weather-Based Insurance etc.

Therefore, climate-smart extension approaches need to be considered as part of a broader set of adaptation measures and policies for agricultural systems at a range of scales. In agriculture there are many technologies and still farmers fall short from technology. Transforming the farmers and rural communities it is possible By means of active research and exchange of knowledge, information and experience will create new dimension among the farmers. So, CSA policies should promote both practices and services, such as financial services and strategies for knowledge sharing and management.

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BANANA PRECISION FARMING



anana is highly remunerative crop. Fruits and vegetables account for nearly 90% of total horticulture production in the country. India is now the second largest producer of fruits and vegetables in the world. Total Banana production of the world is 114.13 million tonnes from a total area of 5.40 million hectares with productivity of 21.26 tonnes per hectare. In India, Banana is grown in about 858 '000' hectares with an annual production of 29163 '000' tonnes with productivity 37.04 tonnes per hectare. The percentage share to total cropped is 0.40. India exports 110.87 '000' tonnes banana



worth Rs, 38852.60 lakhs.

The suckers selected for planting should be 500 to 750 g. in weight and of 3 to 4 months old. The

sareuckers should bear 3 to 4 rings. While planting, suckers to be dipped in the solution of Imidacloprid (17.8 SL.) 0.5 ml. and Mancozeb 3 g.





per liter of water for 15 minutes. For precocious bearing and uniform harvesting, tissue culture plants may be used. The seedlings should be 30 to 45 cm in height with 6 leaves.

The gross cropped area under banana crop is 291429 hectare, out of which 240699 hectare is irrigated and 50730 is unirrigated. Total 225348 hectare under banana is treated with chemical fertilizers. Out of this 213746 hectare is irrigated and 11602 hectare is a unirrigated. An area 157048 is treated with farm yard manure, 27165 with oil cakes and 17182 with green manures.

Banana precision farming includes efficient use of fertilizers and irrigation. Drip irrigation has emerged as an important water conservation technology and is also associated with more yield potential hence

Fertigation schedule in Banana (for 1000 plants, Kg. /week)

Sr. No.	Application time (weeks)	Urea (Kg.)	Mono ammonium phosphate (Kg.)	MOP (Kg.)
1	1-16	4.5	6.5	3
2	17-28	13.5	00	8.5
3	29-40	5.5	00	7
4	40-44	00	00	5

Note: Fertilizers to be appliedshould be calculated as per plant population and number of weeks. Above mentioned dose is for 1000 plants and for one week. better farm income. This system can save fertilizers and electricity. Drip irrigation shows immense potential to reduce weed population. In Banana, 75 percentage dose of Nitrogen and Potash is recommended as compared to total recommended dose of fertilizers through drip irrigation.

Nutrient management and fertigation in Banana

For better yield from Banana, 30 Kg. well decomposed organic manure or 5 Kg. Vermicompost should be applied per plant. For better N fixation and P viability, 25 g. Azospirillum and 25 g. PSB to be applied per plant through FYM.

Micronutrient management:

- Foliar application of 50 g. Ferrous sulphate + 50 g. Zinc sulphate in 10 liter of water at 2nd and 4th month's of planting.
- Application of 15 g. Ferrous sulphate + 15 g. Zink sulphate through 100-150 gram of well decomposed compost or FYM per plant at 5th and 7th month of planting.
- Dr. Sable P. A., Assistant Professor (Horticulture), Sardarkrushinagar Dantiwada Agricultural University, S. K. Nagar, Gujarat and Sushma Sonpure, Sr. Ph.D. Scholar (Agronomy), Mahatma Phule Krishi Vidyapeeth, Rahuri, MS.

HYDROPONICS SUGARCANE NURSERY

An Innovative step towards Value creation



ndia is the second largest producer of sugarcane and sugar in the world and more than 6 million farmers are engaged in its cultivation. Sugarcane is a major crop supplying sugar and energy. This high efficiency crop is grown in tropical and subtropical environments globally. The crop requires 11-12 months for attaining the height of 3-6 meters.

In the past few decades, much research, has been focused on the measures to be followed for increasing the yield and sugar content in sugarcane. Many food processing industries are using excessive chemical fertilizers, pesticides and other toxic inputs for increasing the yield and sugar content of the crop. Use of these chemicals alters the nutritional efficiency of the crop and causes various health problems. One of the major challenges of sugarcane industry is getting good quality propagation material in sustainable manner. Sugarcane growing farmers often complain about poor yields, lack of irrigation water, weed infestation, higher disease infestation, requirement of large amount of propagation material, poor germination rate, transportation of propagation material and unavailability of labour.



Hydroponics is a possible solution to the problems faced by Sugarcane farmers. The aim is to educate and make stakeholders aware of the Hydroponics technology and its advances.

Why these issues have become a point of discussion?

In agriculture sector, sugarcane share is about 7% of the total value of agriculture output and occupied about 2.6% of India's gross cropped area during 2006-07. Sugarcane is a cash crop; profit margin is very high in sugarcane cultivation. It gives better returns with lower input costs. Sugarcane provides raw material for the second largest agro-based industry after textile. It generates employment opportunities for a major sector of the society and hence contributing to Indian economy. About 527 working sugar factories with total installed annual sugar production capacity of about 242 lakh tonnes were located in the country during 2010-11. In a typical sugar mill, 100t of Sugarcane on an average produces 10t of sugar, 4 t of Molasses from which ethanol is produced; 3t of press mud which is converted into biofertilizer, 30t of bagasse used for cogeneration of power to yield, 500 KW electricity and for manufacturing paper. Besides, about 30t of cane tops and leaves are generally left in the field, which through recycling further adds to economic value of the crop. Sugarcane is a C4 plant having high efficiency in storing solar energy and is a most efficient converter of solar energy to sucrose.

Hydroponics – A brief introduction

The word Hydroponics is derived from a Greek word in which "Hydro" means water and "ponics" means working or labor. Hydroponics is a term used to express a technique for growing plants in a soilless medium. Plants are grown in an inert, sterile growing medium and fed a mixture of water and nutrients. The physiological



requirements of the plants can be met without the use of soil. The principle is basic, seed utilizes maximum energy from the nutrients stored in it for developing radical (roots), very less amount of energy is utilized for the growth of the plumule (shoot) .In hydroponics water nutrient and air are maintained directly to the rootball freeing the plant to use its available energy in its upper leaf, fruit or flower development.

Advantages of Hydroponics over conventional

In India, Hydroponics is a comparatively new technology, however all the developed countries have already adopted the technology. Ayurvet is one of the pioneers in developing Hydroponics technology in India. This technology offers following benefits over conventional crop development

• Saving of water - It takes just 2-3 litres of water to produce crop nursery which is approximately 1% of the water used in conventional system. • **Marginal land usage** - On an average it requires less than 1/15th of the space needed by conventional agriculture.

- Reduction in growth time It takes 7-15 days in producing Hydroponics crop nursery whereas in conventional a minimum of 30 – 50 days are required for nursery preparation
- Reduced labour requirementcomparatively less labour is required for raising crops in hydroponics system
- **Constant supply** Year round supply of nursery is available
- **Completely natural** There are no pesticides or fungicides used for cultivation of crop.
 - Enhancement of nutritional value Crop obtained from hydroponically raised nursery has high energy, moisture and Vitamin A and E content. The nutrient contents of the hydroponically raised crops are higher as compared to the conventional crops.
- Temperature control chamber The temperature and Humidity in Ayurvet's Pro Green Hydroponics





machine can be maintained throughout the year facilitating better growth.

Propagation of Sugarcane in Conventional practices

Sugarcane is normally propagated by stalk cuttings consisting of 2 to 3 bud sett. In conventional system, about 6–8 tonnes seed cane per hectare is used as planting material.

Ayurvet's Initiatives

In India, Hydroponics is a new technology, however all the developed countries have already adopted this technology at commercial level. Ayurvet is one of the pioneers in developing Hydroponics technology in India. Ministry of Agriculture, government of India had awarded the commercial test report to Ayurvet's hydroponics machine.

Ayurvet's Pro Green Hydroponics machine is an environmental controlled chamber where crop can be grown irrespective of weather conditions. Multilayer shelves are used for raising Sugarcane Nursery. The amount of light entering the chamber is controlled by glazed windows. Specially prepared nutrient solution is sprinkled at regular intervals to fulfill the nutrient requirements.

Ayurvet Research Foundation has conducted a research trial with the support of NABARD at 10 farmer's field of district Sonipat, Haryana in which Sugarcane nursery was raised in Ayurvet's Pro Green Hydroponics

Machine within 15 days. Healthy canes of 7-9 months having good internode length were selected. Single budded chips were used for raising nursery. Single buds are used for nursery preparation. The controlled environment facilitates approximately 60-70% germination. These 15 days old hydroponically raised Sugarcane nursery was then transplanted manually at farmer's field of district Sonepat. In conventional practices, farmers generally do not raise nursery, however they are using 3 bud sett which takes 40-45 days to reach 2-3 leaves stage.

(B)

The main purpose of the study is to give a possible solution to the problems faced by the farmers like transportation and availability of propagationmaterial, water resources, unavailability of land for cultivation, poor yields, poor germination rate, disease infestation etc.

The results obtained from the study indicate that hydroponically raised Sugarcane nursery is an innovative measure and a possible solution to the problems faced by Sugarcane farmers. The Nursery established successfully in the field with the survival rate of 85%. The germination rate of the hydroponics nursery was 70-80% which was very high as compared to the 33% germination rate in conventional process. The yield obtained was 15 % higher than that of conventional Sugarcane yield. The Brix (Sugar Content) content was at par with the

conventional.

Major crops and nursery produced in Hydroponics machine

Green Fodder - Maize, Barley, oats, Sorghum

Nursery for transplantation - Paddy, Wheat and Sugarcane

Others - Wheatgrass and Barley grass have High medicinal properties. Wheatgrass is widely used by Cancer and heart patients.

Benefits of Hydroponically raised Sugarcane Nursery

 Saving of Propagation material – Normally farmers use 3 bud setts as propagation material whereas in Hydroponics only 1 bud sett is required for propagation. It will save approximately 75% of propagation material.



Single bud chips used in Hydroponics system



Three Bud sett used as propagation material in Conventional system

- Less Requirement of Water- Water required for raising Hydroponics Sugarcane nursery is lower than the water required in conventional practices.
- Higher Germination Rate-Germination rate of hydroponically raised sugarcane nursery is



70-80%, whereas 30-35% germination rate as recorded in conventional practice.



Higher germination rate in Hydroponics system



Lower germination rate in conventional system

- Easy to Transport Propagation material requirement for conventional sugarcane is much higher than that required in Hydroponics because of which transportation becomes very difficult. In Hydroponics only 1/3rd propagation material is required making a clear cut saving of transportation cost.
- Timesaving The technology saves 30 days as the nursery is prepared in just 15 days inside the machine whereas it requires 45



days conventionally.Sugarcane nursery is produced twice as fast as conventional in a well managed hydroponics system.

- Lower disease and weed infestation- The nursery prepared is free from the diseases and the weed and disease infestation in field decreases gradually.
- Less Labour Requirement- It is not a labour Intensive technology. The nursery is prepared inside the machine only, because of which labour requirement frequently decreases.
- Reduces plant mortality rate
- It is an efficient solution to soil fertility and productivity related

issues

- Farmers can exist in places where weather and soil conditions are not favourable for traditional food production.
- New varieties can be developed in a controlled environment and their efficiency can be studied.
- It is a cost effective method
- Extra income can be obtained from crops which can be grown in the saved time and from the higher crop yields

Abha Saxena, Tarun Upadhyay and Dr. Deepti Rai, Ayurvet Research Foundation, Delhi

UNDERSTANDING GENETICALLY Modified Crops and Foods



here is lot of а misinformation campaign going on about genetically modified crops and foods derived from them. The common man is unable to make out what is correct and what is not. Some people who do not have a proper understanding of the subject are also writing articles. Hence it is important to learn some of the realities and scientific facts.

At the global level, genetic modification of crops has been going on in commercial scale for the last 22 years. Research on this subject is going on for more than 50 years. What changes have been going on naturally for centuries are being brought in with synthetic intervention through this technology. The plants of each crop contain a definite set of cells, chromosomes and genes. If a beneficial gene is brought from another plant or bacteria and is synthesized and inserted into

the genome of the crop plant, it is called genetic modification. Through this method we can introduce new abilities and characters into the crop plant. For example, the plants that grow on sea shore have ability to withstand salty air and water scarce soils. This character is given by a specific gene that exists within them. If that gene is synthesized and is introduced into crops, then those crops can be grown in saline soils. In India, we have more than 2 crore hectares of saline soils and farmers suffer because they can not grow any crops in them. This technology can be of use to them.

Through this technology, we can give strength to crop plants to withstand pest attacks, drought situations and grow with less fertilizers. We can reduce use of chemical pesticides and fertilizers. Farmers' costs can come down. Yields can go up. Modifying fatty acid profile of edible oils to make



Ram Kaundinya, former CEO, Advanta Seeds

them healthier, introducing Vitamin A into Rice grain are some of the other applications. The consumers get benefitted by them.

This research started in the USA and is now done globally. 30 GM crops, mainly dominated by Corn, Soybean and Cotton, are grown in 28 countries. Other crops like Canola, Rice, Sugarcane are also there. Bangladesh grows GM Brinjal. Globally more than 18 crore hectares of GM crop is cultivated by 2 crore farmers and are deriving its benefits. These are grown in 5 countries in Europe also. Other countries like Australia, Vietnam, Indonesia, Brazil, Argentina cultivate GM crops on large scale. India stands 5th in terms of acreage.

The only GM crop so far approved by the Indian Government for cultivation in India is Cotton. Work on other crops like Mustard, Rice, Brinjal, Corn is being undertaken, but they have not yet been approved.

GM crops go through a tough approval process. Every one, whether private companies or Government organizations have to go through the same process. It is the same globally. To get this approval, we have to conduct many experiments and with their results we have to prove that the GM crops and the GM foods are safe for humans, animals, soil, environment, beneficial insects and microorgnisms, etc. These are not approved if this safety is not proved. The applications go through scrutiny of two important committees set up between the Ministry of Science Technology and Ministry of & Environment & Forests. Ministries of Agriculture and Health also nominate their scientific experts on these committees. Unless the application is scrutinized by all of them and unless they are convinced by the results of various technical trials and experiments, it will not be approved.

All the globally traded GM foods



come from such approved GM crops. Various scientists and Governments have concluded that these are safe for consumption and are not different from their non-GM counterparts. That is why we can eat all GM foods that come from approved GM crops without any hesitation. The whole world has been consuming them for the last 22 years. Europe is also importing and consuming such GM foods. In India also we import GM Canola edible oil and consume it. We have also been consuming 13 lakh tonnes of oil derived from seeds of Bt cotton for the last 15 years. The de oiled cake of 12 lakh tonnes derived from Bt cotton seeds is being fed to our animals. In the last 22 years, more than 1000 crore meals made of GM foods have been consumed. Not even a single adverse report on the health of humans or animals has been reported so far to any Government.

When we travel abroad we consume GM food. Our children living



in USA, Europe, Australia and similar countries have been consuming them every day. Have you every heard of any health complaint because of consuming these foods?

Many national organizations and International organizations like WHO and FAO have certified that GM crops and the foods derived from them are safe and they do not cause any harm to our health. More than 3000 studies conducted by many organizations and their results have proved that the GM food is safe. Through a report called 'A Decade of EU funded GMO research' European Union has studied results of hundreds of studies and concluded that GM foods are safe. In the USA the 'National Academies of Science, Engineering, Medicine' have conducted thorough studies and has concluded that the GM food are safe. Many Government Institutions in India also have approved the safety of GM foods.

After the introduction of Bt cotton in India, our cotton production has gone up from 130 lakh bales to 370 lakh bales. Cotton exports have touched Rs.50,000 crores. Pesticide consumption on cotton has come down. Farmers' incomes have gone up. Women labour who pick cotton have tripled their earnings. One gene and so many benefits!

It is very important to have a correct understanding of the GM crops and GM foods. Because we will be 170cr population by 2050 and our food security concerns for this population, ever decreasing water availability, climate change, etc will make this technology an important component of the solution. We will need this technology. Is it good for us if we do not understand such a weapon properly and reject it because of what some one tells? If some one tells you that GM food causes cancer or it damages your health do not believe them. Try to understand the science and facts behind the technology. Believe in science. Not in rumours. There is no progress without science!!

ORGANIC AQUACULTURE: A POTENTIAL PROSPECT FOR INCREASING FARMERS' INCOME



he declinina fisherv wild harvests, fish food-safetv issues, environmental concerns, increased fish consumption, and the increasing market share of organic foods have combined to focus attention on "organic aquaculture." Consumer demand may well drive the organic production of finfish, shellfish, and other aquatic species into the mainstream during the next decade. Organic aquaculture has attracted the attention of researchers from several academic disciplines as well as that of environmental advocates and entrepreneurial innovators. A small number of "certified" and noncertified organic fish and microalgae products have made it to the retail market place. While the regulatory specifics still need to be addressed, this new organic market niche has significant potential for growth in the future.

USDA has defined Organic Agriculture as a production system which avoids or largely excludes the use of synthetically compounded fertilizers, pesticides, growth regulators and live-stock feed additives. To the maximum extent feasible, organic farming system rely on crop rotations, crop residues, animal manures, legumes, green manures, off -farm organic wastes, mechanical cultivation , mineral -bearing rocks, and aspects of biological pest control to maintain soil productivity and tilth, to supply plant nutrients and to control insects, weeds and other pests.

ORGANIC FARMING IN INDIA

The all India Federation of Organic Farming (AIFOF) accepts the standards document of the International Federation of organic Agriculture Movement (IFOAM, 1981) which gives the following description.

- To work as much as possible within a closed system and to draw upon local resources.
- To maintain the long-term fertility of soils.
- To avoid all forms of pollution that may result from agricultural techniques.
- To produce the use of foodstuff of high nutritional quality and sufficient quantity.
- To reduce the use of fossil energy in agricultural practice to a minimum.
- To give livestock conditions of life that conforms to their physiological needs and to humitarian principles.
- To make it possible for agricultural producers to earn a living through their work and develop their potentialities as human beings.

FISHERIES AND AQUACULTURE BOOMING IN INDIA:

India is the second largest food producer in the world. Fish and marine merchandise form an important constituent of India's food production. The Indian sub-continent has a promising future in producing marine merchandise as it has 8041 km of coastal line, 3 million hectares of reservoirs and 1.2 million hectares of brackish water. India is presently the third largest producer of fish and is playing an important role in global fisheries. The Indian fisheries sector has grown tremendously since 1950s



to the present annual production levels of over 7 million tonnes of fish and shellfish from capture fisheries aquaculture. India currently and produces nearly 5% of the world's total fish production, and about 7% of the total aquaculture production. The potential for growth is immense and the country is on the threshold of massive development in fisheries and aquaculture. Seafood exports contribute about 3.32% of India's export and are the fourth largest contributor of net foreign exchange to the country. Marine products, especially seafood business in India is booming. In 2009-10, Indian seafood exports business crossed the \$2-billion mark (US\$ 2.1 billion) by exporting about 663,603 tonnes of seafood. About 800 seafood exporters operate in India, but the majority of the marine



products business is controlled by 100 companies. Japan is the largest importer of India's seafood with about 22.6% of the exports but quantities to EU, USA and Australia are on the rise. Frozen shrimp and squid, frozen cuttlefish, frozen lobsters, live crabs and lobsters, live shrimp, finfish, and ornamental fish are the main exports.

Unlike the marine fish production which has been stagnating, as elsewhere, the inland aquaculture production in India is surging ahead. Major interests in India in promoting inland aquaculture surround carps, catfishes includina Pangasius, freshwater prawns, freshwater pearl culture, coldwater fisheries, ornamental fish culture etc. The estimated potential for ornamental fish export from India is about US\$ 30 million. There is also great future for Tilapia, which is being carefully introduced. The marine shrimp sector is well developed with the presence of world's industry leaders, and the recent introduction of P. vannamei. A huge untapped potential lies in developing marine culture including the farming of mussels, edible oysters, marine pearls, seaweeds etc. The potential for open water cage and pen culture in the inland and coastal areas is also immense. Given the abundance of resources with potential and the national importance attributed, aquaculture in India is poised for



great expansion in the near future. At the national level, the govt. of India is planning to develop a road map for enhancing fish production from the present level to 10 million tonnes by 2012; explore avenues to meet domestic demand; and to increase export earning potential in terms of value-added products and ornamental fish trade. The export industry is poised to achieve 5 billion US\$ level by 2012 with 75% contribution from value-added products.

India is presently a growing market for the feed industry. Several major feed plants have established recently with overseas assistance and the demand for feed, particularly the extruded feed is on the rise. Alongside, there is also a huge potential market for aquaculture medicine and husbandry industry.

ORGANIC AQUACULTURE

Organic aquaculture is the farming of aquatic animals like shrimp, fishes, bivalves etc. and aquatic plants without using antibiotics, chemicals, and fertilizers by preserving the ecosystem and biodiversity.

Organic aquaculture practices would help in raising aquatic products in a humane manner i.e. sustainable and pollution free. Organic feed optimizes the health of the animal and to reduce in reliance on drugs, including antibiotics.

Traditional organic farming systems

rely on ecologically based practices, such as cultural and biological pest management and virtually exclude the use of synthetic chemicals in crop production and prohibit the use of antibiotics and hormones in livestock production. Sustainability, environmental stewardship, and holistic, integrated approaches to production are hallmarks of organic systems. Standards for organic cropping and terrestrial livestock husbandry practices have existed for decades.

Interpreting practices and standards developed for terrestrial species into practices and standards relevant to aquatic species, both animal and plant, remains a major challenge for organic aquaculture. How can aquatic operations comply with the requirements for an organic system plan, for obtaining acceptable stock, for implementing health care monitoring and management, for maintaining prescribed "living conditions," for development and acceptance of allowed and prohibited substances lists, for organic feed requirements, for controlled postharvest processing, for nutrient management, and for required animal identification and record-keeping. The main principle of organic aquaculture standards include:

 Absence of GMOs (genetically modified organisms) in stocks and feed prime material : focusing on vegetable feed ingredients (e.g. soy beans) and feed additives derived from bio-technology, as well as on transgenic, triploid and all-female stock

- Limitation of stocking density: considering ecological capacity of site and species-specific behaviour of animals e.g. shrimps: 15 PL/ m3, resp. maximum 800kg/ha per production cycle.
- Origin of vegetal feed and fertilizer from certified organic agriculture, no artificial feed ingredients and networking of organic operations.
- Criteria for fishmeal sources; in general, decreased protein and fishmeal content of diet: permitted are trimmings of fish processed for human consumption or by-catches; no dedicated fishmeal harvesting operations e.g. shrimps: maximum 20% fishmeal/ - oil and maximum 25% total protein.
- No use of inorganic fertilizer: recycling of nutrients instead of intensive inputs.
- No use of synthetic pesticides and herbicides: maintaining natural diversity on the farm area.
- Restriction on energy consumption (e.g. regarding aeration) as a general trend; de-intensification of operations, lowering of input.
- Preference for natural medicines, no prophylactic use of antibiotics

and chemotherapeutics, no use of such substances in invertebrate aquaculture or live feed culture.

- Intensive monitoring of environmental impact, protection of surrounding ecosystems and integration of natural plant communities in farm management, focusing on the effluents of farms and the design of pond farms.
- Processing according to organic principle basic requirement for a final product to be certified as organic.

CONVERSION TO ORGANIC AQUACULTURE

Conversion to organic aquaculture is a process of developing farming practices that encourage and maintain a viable and sustainable aquatic ecosystem. The time between the start of organic management and certification of the production is known as the conversion period. production Aquaculture methods can vary widely according to biology of the organisms, technology used, geographical conditions, ownership structure, time span, etc. These aspects should be considered when the length of conversion is specified. The minimum conversion period set for the aquaculture production system is two years.

ORGANIC CERTIFICATION AND STANDARDS

Certified "Organic" assures that products were produced and/or processed under conditions required National Standards and/or by International standards for Organic Production. Standards are guidelines for the management of the whole production process, including postharvest and sometimes social aspects. Standards can also serve as information for the consumer. Standards should be based on scientific knowledge or at least not in opposition to it.

The International Federation of Organic Agricultural movement (IFOAM) is a global umbrella body for organic food and farming. IFOAM's goals are the worldwide adoption of ecologically, socially and economically sound systems that are based on the Principles of Organic Agriculture. IFOAM's Organic Guarantee System (OGS) is designed to facilitate the development of organic standards and third-party certification. IFOAM Certification bodies are accredited by the International Organic Accredation Service Inc. (IOAS) on the contract base.

GLOBAL ORGANIC AQUACULTURE PRODUCTION AND MARKETS

The numbers of certified organic aquaculture operations (including the production of micro algae) amount to 240 in 29 different countries in 2015. Most of the operations are located in Europe. However, it has to be considered that these are often small scale carp or trout farms with less than one hectare pond surface, typically run on a part time basis. In China, 72 operations have received organic certification under the national Chinese regulation.

CURRENT STATUS OF ORGANIC AQUACULTURE IN INDIA

The brackish water area available in India for shrimp farming includes the existing traditional prawn filtration fields also, which are located in West Bengal (46100 ha) and Kerala (10700 ha). These vast filtration areas are actually paddy fields. belonging to several entrepreneurs, who do salt resistance paddy cultivation by themselves and later auction the area, after paddy cultivation for doing the seasonal traditional prawn filtration, when the water become saline in nature due to inundation . The traditional type of prawn filtration system is highly environment-friendly as they use no antibiotics, chemicals, etc. and hence the paddy fields can easily be adopted for organic aquaculture. Organic products have become very popular now a days due to rise in health and environmental

awareness, concerns on food safety and there is a growing demand in developed countries, especially; US, EU, etc. All the big super markets, Coop (Switzerland), Aimare (Austria), and Bristall Bay (USA) are searching for organic product supply throughout the world. India is one of the richest in terms of shrimps and fish resources in the world.

MPEDA proposed to implement organic aquaculture in India by availing the consultancy and technical collaboration from the Swiss Import Programme (SIPPO), Promotion Zurich, Switzerland. In this context, MPEDA has signed a MoU with SIPPO in January, 2007 at Chennai during INDAQUA 2007 to launch the programme. MPEDA conducted earlier three workshops exclusively for Organic aquaculture; one each in the States of Kerala, West Bengal and Andhra Pradesh in association with INFOFISH and Naturland, where technical sessions were held by the concerned technical officials, to create awareness among the entrepreneurs about organic farming.

MARKETING

The prices for the organic prawn were fixed well before the beginning of the crop. Based on a mutually agreed price structure, an agreement had been signed between various Marine Exports and society representatives for the quantities of organic prawn to be supplied and its final price.

Organic prawn farmers are happy with the overall outcome of the crop. There were no disease incidents, growth was good and farmers could make decent profits. As a result 112.83 ha of new scampi farming potential areas are being identified and assessed for feasibility to implement the organic project.

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ROMANESCO A PRETTY SMART VEGETABLE

omanesco is one of the un-exploited cruciferous vegetables which was cultivated 500 years ago in Italy. Also called as Romanesco Broccoli, Roman Cauliflower, Romanesque cauliflower, Broccoli Romanesco, Broccoli Apple and Cauliflower with Turrets, it bears unusual spiral, lime-green florets conical buds on its spiral head that look like something out of the ocean or from prehistoric times, which is somewhat similar to its close relative, the cauliflower with a crisp texture and slightly distinct sweet flavor. Sometimes it is also called as "Broccoflower" which is widely used to describe all green colored varieties.

As curds are very decorative with jewel like appearance, it has occupied the flower gardens as ornamental plants and also the centre of attraction in dinner parties as a salad. A food critic writing for the New York Times once described Romanesco as "An alien vegetable" that looked as if it had come from outer space. Apart from appearance, Romanesco is rich in nutrients, so it providesa great way of providing variety in your family's diet. This is consumed as salad or cooked as whole, dunking it in boiling water for a few minutes until tender and served for consumption.Romanesco is recently been awarded with RHS Award of Garden Merit.

ORIGINS

This amazing vegetable has its roots very firmly in ancient 16th century in Italy, it is sometimes described as a type of broccoli, sometimes as





Roman cauliflower and interestingly Germans often referred to it as a type of cabbage. While some report that it is the result of "selective breeding". But, quite why it hasn't been more popular is a mystery. It belongs Brassica oleracea species which also includes broccoli (Brassica oleracea variety italica), brussels sprouts (var.gemmifera), cauliflower (var. botrytis), cabbage (var. capitata), kale (var. acephala), and kohlrabi (var. coulorapa).

NUTRITION

In addition to bearing spiral, limegreen beautiful florets, Romanesco is also one of those wonderfully healthy vegetables. It is said to improve one's eyesight, fight viruses, boost the immune system and generally make the body healthier than ever. It is packed with vitamins C, K and as well as anti-oxidants, but low in calories, making it a multi nutrient food that is ideal for the vegan diet. It has many other properties such as, Antiviral, Anti-inflammatory, Antioxidant, Antibacterial, Antidepressant, Antimicrobial, Anti-carcinogen effects, as it is very rich high in a flavonoid compounds such as kaempferol, which has been shown in multiple studies to kill cancer cells and prevent the formation of new cancerous ones.

Additionally, it also contains sulforaphane and isothiocyanate, which boost our liver's ability to remove cancer-causing toxins before cancer develops. Some of the studies also revealed that Romanesco can address cancer of the bladder, breast, colon, prostate, and ovaries. Apart from this Romanesco also contains considerable amount of iron, folate, and vitamin C levels. This make it an excellent choice for combating anemia and infertility and also improves bone density in woman.

As, Romanesco is low in calories and rich in fibers, it provides a strong



Romanesco Pakoras



Romanesco with Salsa Verde Roasted



nutritional punch without negatively impacting your waistline. It also aids in better digestibility and also provide a feeling of "fullness," which helps to maintain a healthy bodyweight.High content of carotenoids improves skin appearance and tone.

CROP MANAGEMENT

Romanesco is a cool season crop, grown much similar as cauliflower, which possesses thick stalks, and wide, rough leaves and a "flower" in the centre. The central head gets large and entire plant can be grown up to 2 feet in diameter. The plant is frost hardy, suitable to be grown in temperate areas. It tends to "bolt" and set seeds if the weather becomes hot. So, it is recommended to be grown in spring and autumn season.

It requires partial-shade along with lots of nutrients to grow well and thrive, and it prefers well-drained fertile soil rich in organic matter and pH ranging from 6.0 to 7.5. Romanesco needs an optimum temperature of 45 °F to 85 °F for germination of seeds, but can germinate even if soil temperatures are as low as 40 F and takes around 4 to 7 days for seed germination.

The crop is transplanted when seedlings are 6-8 cm height at a distance of 60 cm between plants and 60-90 cm between rows, which facilitate intercropping of short duration crops such as salad leaves or radishes, in-between the rows while the plants are still young and brings additional income to farmers.

Romanesco can be grown as

companion crop with Dill, artichokes, chard, beet, borage, chamomile, nasturtium, carrot, celery, cucumber, spinach, beans, hyssop, lettuce, mint, marigold, oregano, peas, potatoes, rosemary, sage and thyme.

Generally, Romanesco comes to harvesting stage around 75-100 days after planting, either it can be harvested as a whole by giving a cut close to ground level with a sharp knife when the florets of the head are tight and dense, or individual florets in stages.

POST HARVEST

Florets of Romanesco is washed, graded before blanching and immediately frozen by transferring into ice water for a few minutes followed by draining out excess water and finally packing in a tightly sealed bag and then stored for a week in refrigerated condition at 0-4°C.

Romanesco is usually consumed as fresh as soon as possible since it loses its nutrient and taste very guickly. It has extensive use in Salads and decoration of dishes, stir fried, steamed. In some western countries like Italy; it substitutes cauliflower and broccoli, as the taste is similar to that of cabbage and consumed in many forms such as cauliflower cheese or simply eaten individually with melted butter to give characteristic flavor. Some of the other dishes made out of Romanesco are Romanesco quiche, roasted romanesco soup, romanesco stir fry, romanesco Cacio e Pepe etc.

To conclude, Romanesco is known for its artistic appearance and highly nutritional qualities. This crop remained unexploited and gained its attention in past few years as it is packet of nutrients as well as many medicinal properties, so there is a raise in demand in urban areas. In future Romanesco fetches higher returns to farming community than any other cruciferous vegetables in India.

Arjun, K. and Prasad Basavaraj

Purad, Tamil Nadu Agricultural University, Coimbatore, India. There are many challenges in the agriculture sector. You cannot have temporary solutions to agriculture. Loan waiver, free current ... they are temporary. What is needed is remunerative price, infrastructure support for agriculture and cheap credits. Unfortunately, for political reasons, we move to populistic, temporary measures. The best method of (improving) agriculture, according to me, is the strengthening of the cooperative movement. This has to be understood by all including the planners, Niti Aayog, political parties, Parliament, people and media"

> M VENKAIAH NAIDU Vice-President





Innovation and new ideas by startups can play a major role in the agriculture sector

SURESH PRABHU Commerce and Industry Minister

"Market and Monsoon behaviour will be the two major challenges faced by the Indian farmers"

> PROF. MS SWAMINATHAN Renowned Agriculture Scientist

