

# AGRICULTURE The National Agriculture Magazine TODAY

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## POWERING INDIAN FARMS





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## AGRICULTURAL MECHANIZATION CRUCIAL TO INDIA

India's agriculture is slowly shedding its image of being traditional. The rapidly expanding population and diminishing resources have necessitated use of better technology, automation and sustainable means of agriculture. Mechanization, that until recently considered an auxiliary, has become an essential input in today's agriculture. India's dissipating farm labour population is also demanding a change in the way agricultural operations are carried out in the field.



Currently Indian farms are mechanized to the extent of 40 per cent, with the most concentration being in the tradition agricultural foot holds of Punjab, Haryana and Uttar Pradesh. In India, tractors are the most popular and hence the largest segment in the equipment category. This was what led to the 'Tractorisation' of India. Custom hiring centers popularized other equipments and machines. With government interventions such as subsidising purchase of equipment as well as supporting bulk buying through front-end agencies, providing credit and financial assistance to support local manufacturing of farm mechanisation equipment, adoption of farm mechanisation has seen much improvement. Several indigenously developed agricultural tools and implements have also evolved over time to comply with small farm sizes. They played a very important role in India's farm mechanization.

However, India today needs more mechanization than ever. The yields across the traditionally growing regions are scarcely responding to the inputs and this has set the stage for an alarming situation. For a country that is all geared up to take its new role as an economic super power in the larger global arena, its food economy is equally crucial. Until a scientific breakthrough is materialized, the agricultural world is left with the option of making the best out of the situation. Currently the only way is to increase input use efficiency and keep the profession profitable by minimizing the cost of production.

Farm machines can play a significant role in making agriculture efficient and viable. Studies have shown a direct relationship between farm mechanisation and farm yield. Use of appropriate machines have found to save around 20% of seeds and increase yield by 15%. The same trend has been observed with fertilizers as well. Farm mechanisation can also help significantly in reducing time for carrying out different agricultural operations by approximately 15-20 percent. Notwithstanding its impressive advantages of improving the harvest and reducing the post-harvest losses, farm machines can considerably improve the quality of cultivation. The reduction in drudgery and time spent in agricultural operations can attract the youth towards taking up agriculture and improve its social standing. These benefits and the savings in inputs will help in the reduction of production costs and allow farmers to earn more income.

Farm mechanization undoubtedly remains India's bet on sustainable and profitable agriculture. But fragmented landholdings can severely restrain India's farm mechanization. India should research and invest on machines that are amenable to Indian conditions.

*Anjana*

**Anjana Nair**

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## Maharashtra's Next leg of APMC Reforms

*The state mulls delisting pulses and oilseeds from APMC*

**M**aharashtra has come again with a market forward reform slated to benefit the farmers of the state. The government is exploring the possibility of delisting pulses and oilseeds from the ambit of the Agricultural Produce Market Committee Act, 1963. The move is supposed to ensure remunerative prices for farmers.

It is not the first time, the Maharashtra government has taken the bold measure of freeing agricultural commodities from the stronghold of restrictive mandis. In July last year, the State had notified delisting fruits and vegetables from the purview of the APMC Act, paving the way for the direct marketing of these commodities by farmers.

The growers have been handsomely benefited by this move. In a report presented to the central planning agency, NITI Aayog, the state government has revealed that the turnover of 94 farmer markets across Maharashtra has touched Rs 5 crore per week with sales in the region to the tune of 800-1,000 tonnes. The profits earned went directly to the cultivators instead of getting divided among various players from farm to market.

Deregulation has helped farmers to have a choice of where to sell and whom to sell. Before the amendment, farmers were forced to sell only in certain markets. The buyers were not consumers, instead traders or commission agents. The players in the protracted supply chain ate a fair share of profit. Since the deregulation, farmers have set up markets across the state and have been able to sell their produce directly to the consumers. Around 94 farmer markets have come up in big cities such as Mumbai, Thane, Pune, Nashik and Navi Mumbai and the response has been overwhelming. Farmers who cart their produce to these markets usually go back sold out. On an average, 30-35 stalls are put up in each market. By eliminating the middle men, the profit share of the farmers has risen. The consumers, on the other hand had the fortune of getting farm fresh vegetables. Moreover, the consumers also get the added advantage of finding less commonly available vegetables in the urban markets which are grown in certain specific regions.

Buoyed by the success, the state government is exploring the possibility of following the same model in oilseeds and pulses. Pulses and oilseeds figure in India's list of 'most wanted' commodities. The demands are generally met by imports and this has most often led to increased pulse prices and heavy import bills. To arrest this trend, the government is vehemently supporting pulses and oilseed cultivation. Maharashtra too had joined the race. Maharashtra Pulses Mission was launched in 2010 to project Maharashtra as pulse bowl of India. Combined with other initiatives, Maharashtra has been able to step up its pulse production. The pulses productivity of the state increased from 264 kg/ha in 1970-71 to 462 kg/ha in 2014-15. Under National Food Security Mission, Maharashtra was awarded for best performance in pulses successively for 4 years since 2008-09. With a pulses bounty at hand, Maharashtra has taken the next obvious step to bring the benefits to the farmers.

By delisting pulses from the APMCs, Maharashtra is trying to bring the benefits to the farmers by giving them, markets of their choice. This will also be an incentive to the farmers as they will get remunerative prices with no leakage in profits. However, unlike fruits and vegetables, pulses can be stored for a longer period of time. So there will always be a threat of artificial shortage. The government should therefore examine this angle as well while considering the delinking of pulses and oilseeds from the mandi frame work. Beyond that it is a well appreciated move.



## Pesticide Carnage

*Pesticide application claims lives of farmers*

**T**he tragedy that has struck the cotton farming community in Yavatmal is a stark reminder of the shoddy attitude of the safety measures while dealing with pesticides in India. This further brings a shadow on these forms of plant protection measures that dwell upon the toxicity of chemicals on living cells. It further elevates the responsibility of the pesticide companies on preaching ways of safe approach towards plant protection chemicals. The farmers who lost their lives to pesticides, were in fact victims of apathy rather than poisoning.

Yavatmal, the cotton city of Maharashtra, has fallen victim to an avoidable tragedy. Around 36 farmers have lost their lives to pesticides when they came into contact with them during their application in cotton fields. Around 1800 farmers have been affected by the inhalation of pesticides so far. The cause of death has yet to be ascertained with finiteness by the authorities, but pesticide poisoning has been attributed as the main suspect. The problems began as early as July, when farmers started developing discomforts that eventually led to fatalities of this magnitude.

Experts have pinned the reasons behind the fatalities to the unscientific way of using pesticides. This year the application of pesticides extended for a longer time. Some blame it on the height of the crop and heavier foliage which incited the attention of the pest necessitating application of pesticides. Some believe that the current variety was no more immune to boll worms and the resultant pest population which were not responding to the current plant protection regime were subjected to a dangerous improvised cocktail mix of pesticides. Some even suggest the unfavourable environmental conditions like humidity that hastened the entry of the poison into the applicators body. The blame has also fallen on the new type of sprayer, whose smaller droplet sizes caused rapid absorption of the chemicals in to the body.

Whatever the reason, the situation calls for an assessment at the grass root level. Pesticide over use and misuse has become very common in India. Reports of pesticide residues over the prescribed limits which make into the news quite frequently also points to the unscientific way of using pesticides. But a fatality of this scale is unprecedented in recent times. It brings to the fore a very pertinent question as to how safety is perceived among the farming community. How much effort or time is spent by the extension officers or the producers on reinforcing the notion of safety among farmers? Are the farmers aware of using protective gears to avoid contact with pesticides?

A safety audit is significant to ensure the pesticides do not go beyond their intended targets. Stringent measures must be adopted to encourage safe use of pesticides. Although the packets of pesticides have explicitly described the use of safety gears while applying pesticides, farmers tend to ignore it considering the cost of procuring them. The government should take the lead in distributing protection kits through subsidies or incentives and at the same time conduct regular awareness programmes to spread the message. Hand gloves and masks must be made mandatory while using pesticides. Mixing different pesticides without adequate technical guidance must be prohibited by law. Vendors and dealers of pesticides must be licensed. A nation wide campaign must be organized for awareness among the farmers regarding the do's and don'ts when it comes to pesticide usage. The notion that pesticides are medicines must be removed, instead their poisonous effects must be highlighted.

The pesticides are easily accessible in India. Farmers don't need a prescription and there are no limits on the purchase of pesticides. The pesticides and their doses are usually decided by the farmers. This system needs to change. More scientific approach and stringent regulatory measures can not only avoid situations like this, but also help in the sustainable means of agriculture.

## Hunting Hunger Down

*World Food day celebrated on October 16 stresses on food security*

October 16 marked an important day in the calendar. The world celebrated the World Food Day which calls forth the attention of the citizens of the world towards the concerns related to food security and hunger. The day commemorates the founding day of the Food and Agriculture Organization, world's premier institute that has been involved persistently to raise the food security and eliminate hunger and malnutrition through global efforts.

This year the World Food Day was observed with the theme of "Change the future of migration. Invest in food security and rural development". Hunger and malnutrition has been a persistent malaise our world has faced. Limited resources, expanding population, social inequity, conflicts, war and poverty have taken a toll on the even distribution of food among the people. Ironically, the world produces enough food to feed everyone, yet, about 800 million people suffer from hunger. Hunger kills more people every year than malaria, tuberculosis and AIDS combined. This year, the event holds special significance as global hunger rises for the first time in over a decade, affecting 815 million people or 11 per cent of the global population. The increase is largely due to the proliferation of violent conflicts and climate-related shocks which are also major drivers of distress migration.

Agriculture which is the sole engine that has the responsibility to produce more food, hence comes under immediate scanner. Estimates suggest that the world will need to produce 60 percent more food by 2050 to feed a growing population. It is a challenge considering the plethora of setbacks the sector itself is facing. Growing population has put a restraint on the land available for farming. In many developing countries such as India where economic development has taken the lead, many cultivated areas are being converted into urban dwellings. Farm lands are shrinking. As per the recent Agriculture Census, small and marginal holdings of less than 2 hectares account for 85 percent of the total operational holdings. The average size of holdings has declined over the years and has come down to 1.16 hectares in 2010-11 from 2.82 hectares in 1970-71. The shrinking size of the average land holding of an Indian farmer has held back agricultural productivity. Farmers have started quitting agriculture in search of better job opportunities. According to the National Sample Survey Organisation, 45 per cent of the farmers interviewed wanted to quit farming. Declining profitability of agriculture, increasing cost of production and better paying prospects in other fields have collaborated in this decision. Climate change is yet another problem of recent origin that has tweaked with the economic prospects of this profession. No other sector is more sensitive to climate change than agriculture.

Migration that arises out of desperate situations of war, poverty and climate change, changes the world demographics that have also put inordinate burden on world agriculture. Displacement of population has destroyed agriculture in certain areas at the same time increasing the burden on agriculture of the host country to feed the immigrant population. This sway in the food load has affected not only the food economy but also in the general economic situation of the country. It becomes the responsibility of the host nation to support the migrants for an excessive length of time.

In the event of changing world dynamics, it becomes imperative for the world leaders to assure food security for all by tackling climate change and ending conflicts. At the same time, the nations around the world should invest more in agriculture than in the defence capabilities of the country. The share of investments in research and development in agriculture should be stepped up to evolve sustainable agriculture that ensures food for all. Once hunger and poverty is eliminated from the world chances of public unrest and wars would dissipate. The countries around the world should raise their defenses against food insecurities and not on each other.

## The Illicit HT Affair

*HT cotton cultivation rampant in India*

While India is still inconclusive regarding its policy on GM technology, illegal trade of GM seeds is rampant in different parts of India. This parallel market has drawn a huge crowd of customers. This illegitimate market is worth about Rs 472 crore according to Delhi-based South Asia Biotechnology Centre (SABC).

Backed by top scientists of India, SABC has reported that about 35 lakh packets of illegal HT cotton hybrids were sold this kharif season across the major cotton growing belts such as Telangana, Maharashtra, Gujarat, Andhra Pradesh, Odisha, Karnataka and Madhya Pradesh. Shockingly around 8.5 lakh hectares, or 7% of the total cotton growing area in the country, is under illegal cultivation of Herbicide Tolerant (HT) variety. The HT cotton samples collected were tested positive for the presence of glyphosate tolerant gene. This amply suggests the extensive illegal and spurious sale of HT cotton which has not been technically and officially approved in India so far. The only Genetic Modification that India ascribes to are hybrids/varieties that contain 'cry1Ac' and 'cry2Ab' genes, isolated from the soil bacterium *Bacillus thuringiensis* (Bt) and coding for proteins toxic to bollworm insect pests.

The existence of clandestine cultivation of HT cotton was reported as early as 2008. But the report has not received its fair share of attention either from the government authorities or any other organizations. The trade continued and today it has reached a sizeable portion.

It is ironic since the country went ballistic with GM Brinjal trials and the scientifically tested and recommended variety which was legally ready for commercial cultivation had to be shoved back into the laboratory. This particular variety which has not even reached that stage in the commercial release has found a way into the farmers' fields.

Ease of weed management in HT cotton has made this a hot favourite among its users. Call it desperation or excitement, the farmers do not mind shelling extra money to get hold of it. Farmers are eagerly trying out different varieties that could ease their cultivation and derive extra monetary benefits. In this case, the weedicide tolerant attribute allows farmers to control weed by spraying herbicides rather than going in for cost-intensive manual or mechanical means of weeding. This extended phenomenon points out at the gaping void in the demand and supply of varietal traits. The attributes deemed a novelty by a researcher, may not be an essential quality that the farmer would be searching for. The research sources –private or government – should understand the ground realities and address the problems faced by the farmers. The direction of research should be dictated by the requirements of the farmers and not merely an extension of previous investigations.

Another issue that quite obviously surfaced is the inadequacy of the regulatory bodies. In this case, the problem surfaced a decade ago and has now assumed proportions that are too big to ignore. The trade is happening in diverse parts of the country united by a common crop and common problem. This means there is a heavy demand and the demand is being quite adequately met. Despite the magnitude of the trade and the acknowledgement of the same by the authorities, no tangible action has so far been effected which leads to the general belief that it received tacit approval from the establishment. A competent, effective and autonomous biotechnology regulator is pertinent for the agriculture biotechnology segment of the country. The Bill for setting up the Biotechnology Regulatory Authority of India, which has been pending for long should receive immediate attention by the Parliament.

Biotechnology is a very important tool on which agriculture has laid immense faith. The technology of genetic modification is a science of tomorrow which can deliver miraculous solutions for problems of today. The only thing we need is an authority that is a facilitator, promoter and most importantly a regulator.



## Stewardship in Action

► DuPont Crop Protection's championing of product stewardship via its much-lauded annual Environmental Respect Awards, is proving a reputation winner, with participation growing to record levels in AP in 2017. The program seeks to recognize customers' stewardship endeavors, increase value for stewardship and reach customers in an unprecedented way. India's Narayani Agrichems Pvt. Ltd. takes its commitments to the community, environment and its employees seriously. So much so that the DuPont Crop Protection distributor was recently named as winner among three ambassadors of respect for Asia Pacific in the annual Environmental Respect Awards held in Wilmington, Delaware. A committed advocate of stewardship in farming, CEO, Mr MPT Venkata Reddy, demonstrated to judges that his vision in support of better, more safe, sustainable farming practices was reflected in his business. Mr Reddy's business utilizes technology in the form of closed circuit security cameras to monitor storage facilities and all staff are routinely trained in stock management and security. The business's initiatives include a detailed plan, annual drills and intensive staff training provided to ensure that all employees understand how to respond in the event of emergencies. Business leader for DuPont Crop Protection South Asia, Ram Mudholkar, says that businesses such as Narayani Agrichem, highlight the significant importance and value of stewardship. Ram Mudholkar, President, DuPont South Asia, said "Stewardship is critical for product lifecycle management and it enables confidence building among all our stakeholders for a sustainable business. A noted author once said that "A leader is a steward of trust" and as a business head, I feel it is critical to practice what we preach and live up to our commitment.

## Aditya Birla group set to exit fertilizer biz this yr

► The Aditya Birla group is set to exit the fertiliser business, with two players valuing the division at around Rs 3,000 crore. The group had decided to exit online retail and textiles in the last quarter. According to sources, two players have submitted final bids with a West Asia-based company leading the race for the division, currently housed in Grasim Industries. The sale is part of Chairman Kumar Mangalam Birla's plans to exit all low-margin businesses that have failed to scale up in the past few years. Besides, delayed payment from the Indian government for selling products at a subsidy was another key reason for the company's interest to exit the business. Indo Gulf Fertilisers, which was part of Aditya Birla Nuvo before its merger with Grasim, reported a 13 per cent year-on-year decline in both revenue and profit before interest and tax to Rs 2,165 crore and Rs 154 crore, respectively, in 2016-17. The decision to exit from the fertiliser business was taken after Grasim decided to merge its operations with Aditya Birla Nuvo last year. After 'New Grasim' and Aditya Birla Capital were listed, the sale talks gained momentum with a West Asian company making an aggressive bid, say insiders.



## Monsanto, Mahyco face heat over GlycelBt Cotton

► A Left-leaning farmers' organisation has demanded tough action against US-based agricultural firm Monsanto and its Indian partner, Maharashtra Hybrid Seeds Company (Mahyco), for alleged criminal negligence, resulting in large-scale cultivation of unapproved genetically modified (GM) hybrid cotton crop. Recent news reports, backed by laboratory tests and other empirical evidence, suggested that GM cotton seed with twin transgenic traits of herbicide tolerance and bollworm resistance — popularly known as GlycelBt Cotton — was being cultivated across major cotton-growing states, including Andhra Pradesh, Maharashtra, and Telangana. However, it has no seal of approval from the Genetic Engineering Appraisal Committee

(GEAC) of the Ministry of Environment, Forest and Climate Change (MoEF&CC), nor is there a licensed seller. So far, only Bollgard I and Bollgard II hybrid cotton seeds with bollworm resistance trait are approved for cultivation in India.



The Communist Party of India-affiliated All India Kisan Sabha (AIKS) holds Monsanto and Mahyco responsible for the situation based on the assumption that the initial source of the leak was the field trials conducted by Mahyco on GlycelBt or Round-up Ready Flex (RRF) cotton seed developed by the American company some time back. It points out that Rule 9 of the Rules 1989 of the Environment Protection Act prohibits deliberate as well as unintentional release of genetically engineered organisms/hazardous microorganisms or cells (without approval). "We request the GEAC to immediately initiate criminal proceedings against Monsanto and Mahyco for deterrent punishment, as the damage to the environment is huge," the farmers' body said.

## Cargill Foods Plans Launches to Expand India Presence

➤ Cargill Foods India, a local unit of the largest closely held company in the US, is expanding its food retailing business in the country to include more edible oil brands, wheat derivatives, and vegetable proteins. "We intend to introduce more products into fats, carbohydrates and proteins. These will serve the needs of a typical Indian household's kitchen," said Deoki Muchhal, MD, Cargill Foods India. At present, the company markets wheat flour, edible oil, and food ingredients. It also trades in grain, oil seeds, cotton and animal feed. Muchhal said that in the protein category, Cargill Foods may introduce a soya or grain or pulses-based product. "In carbohydrates, we are already there with wheat flour and now we will look into derivatives with a health quotient, such as sooji or dalia," he said. The company also believes that there is space for a healthy brand of oil that would blend some essential fats. "We are going to create edible oil products suited for local consumption. We are not a country where we eat a lot of salad with an oil topping. We like to cook, so we will come with a formulation that enables housewives to cook, maintain health quotient and manage the taste," said Muchhal. Cargill currently mills 2,500 tonnes of edible oil a day and these are sold under the brand names of Nature Fresh, Gemini, Sweekar, Leonardo olive oil and Rathvanaspati. Muchhal said that the annual consumption of edible oil in the country was growing by 4% to 5%, while packed edible oil consumption was increasing by 15% to 18%, demonstrating increasing consumer preference for packed varieties of cooking oil.

## Done with UB Group, MCF gears up to take on fertiliser rivals

➤ Mangalore Chemicals and Fertilisers (MCF) has shrugged off its innings with the UB Group and is all set to enter the big league of fertiliser majors. MCF Managing Director Suresh Krishnan told BusinessLine the company plans to invest Rs 1,000 crore over three years to set up a phosphatic fertiliser plant as well as improve its energy efficiency levels. MCF, now a subsidiary of Zuari Fertilisers and Chemicals, an Adventz Group company, plans to set up a new manufacturing facility to produce 700,000 tonnes of phosphatics a year in Mangaluru, Krishnan said. Zuari Agro, which owns stakes in Paradeep Phosphates and MCF, produces about 4 million tonnes of fertiliser and plans to add another 1 million. Half of that will come from the new Mangaluru plant. Zuari had acquired a 53 per cent stake in MCF for about Rs 700 crore in May 2015. UB Holdings and associated companies have an about 22 per cent stake. However, UB does not have any representation in the freshly constituted board of MCF, which has helped the latter get short-term loans from banks and other institutions. Krishnan said a policy bottleneck has been cleared with the Centre allowing MCF to use naphtha as feedstock till it receives gas from the Kochi terminal, which is expected by early 2019.

## Monsanto settles royalty dispute with 3 Indian cotton seed firms

➤ Mahyco-Monsanto Biotech India Pvt Ltd (MMB) has settled the royalty dispute with three cotton seed makers – Ajeet Seeds, Kaveri Seed Co Ltd and Ankur Seeds. The three companies have cleared payment dues of around Rs 300 crore. However, the arbitration process is on with Hyderabad-based NSL Group, and it still owes Rs 144.9 crore to MMB. MMB has licensed a gene to more than 45 local cotton seed companies in lieu of royalties and an upfront payment for producing genetically modified cotton seeds. MMB's management control is with Monsanto India. Monsanto India spokesperson said that in FY 2015 a limited number of sub-licensee seed companies had withheld a large sum of money due to MMB on suspicious grounds. While most of the early disputing seed companies had withdrawn their contentions after discussions with MMB as early as FY2016, disputes with a few other seed companies were referred to arbitration.



## Tierra Buys DuPont's Cotton Seed Business

➤ US-based DuPont Pioneer has sold its cotton seed business in India to Hyderabad-based Tierra Agrotech, which had earlier this month bought US major Monsanto's branded cotton seed business. Tierra Agrotech has signed a definitive agreement to acquire Xylem Seeds, a wholly owned subsidiary of Pioneer Overseas Corporation of DuPont Pioneer, Tierra's managing director Suresh Atluri said. He did not disclose the deal size but said Xylem seeds was doing an annual sales of '60 crore from the cotton seed business. With this, Tierra's overall market share in the hybrid cotton seed business in the country will rise to 6%. Atluri said the assets will include cotton seed germplasm, intellectual property, distribution rights, registration of cotton brand and future products in pipeline.

## Centre reviews list of banned agrochemicals

Recent farmer deaths due to pesticide use in Maharashtra have prompted the Centre to revisit its list of banned agrochemicals. Any decision will, however, be taken only after it receives the final report of the probe initiated by the state government. A central team, comprising experts from the Faridabad-based directorate of plant protection, quarantine and storage, has visited the affected districts to assist the state in its probe into the deaths. "It's not yet clear whether the farmers used banned pesticides or a concoction of permissible ones which might have turned hazardous," said an official of the agriculture ministry, which updates the list of pesticides and insecticides for use on the advice of an expert committee. He added, "The probe will also... clarify whether the farmers adhered to the dos and don'ts while spraying the pesticides."

## States may get room to buy commodities in price crash

The Centre is looking at ways to compensate farmers for a sudden drop in open market prices of commodities, including giving states freedom to purchase farm produce other than grains as and when required. A national price deficit scheme, on the lines of a direct compensation scheme implemented in Madhya Pradesh recently, is also being considered. Sources said senior Madhya Pradesh officials were recently in the Capital to apprise the Centre about the scheme and its performance. States might be allowed to cushion the blow on farmers via a proposed market assurance scheme. It allows states to purchase any commodity whose price has fallen below the minimum support price (MSP) without waiting for the Centre's approval. New Delhi will compensate up to 25-30 per cent of the loss on the value of the MSP and this can go up to 40 per cent for Northeastern states. A corpus would be created by states to cushion a price fall. The fund would be supplemented when a profit is made from the sale of the procured commodity.



## Focus on natural pesticides as farmers die of insecticide use

As 19 farmers have died in Maharashtra due to pesticide poisoning and over 700 remain affected, the Centre is seriously considering promoting bio-pesticides to reduce the domestic use of agro chemicals. The plan comes even as states have been found lacking the will to prosecute the companies making fake products. While 50 per cent of the agro chemicals produced are used in the country, the remaining are exported. So, the Centre will focus on lowering the pesticides use in the country without affecting the yield, sources said. The agriculture ministry is studying recommendations of a committee and may take suitable actions in the next few months, sources said, adding that there could be a scheme to promote bio-pesticides.

## Centre to offload some of pulses buffer stock

The government has decided to dispose off 0.55 million tonnes of pulses from its buffer stock of around 1.8 mt, at lower rates, to five states and for central welfare schemes such as the mid-day meal programme. It is also willing to work with them to evolve a system for real-time updating of the list of beneficiaries covered under the National Food Security Act (NFSA). Such automatic updating would enable the Centre to address concerns over addition or subtraction of beneficiary names from the



Public Distribution Scheme (PDS) list due to change of address, marriage or death, a complaint it repeatedly faced during its recent nationwide social audit of NFSA. Last year, the government decided to create a buffer stock of pulses, to ensure better prices for farmers and to augment supply in times of price rise. About two mt was got via both local buying and import.



## Centre moves to check rising prices of sugar, onion

➤ Centre imposed stock limit on sugar mills for September and October ahead of the festive season. Food and Consumer Affairs Minister RamvilasPaswan said sugar mills will not be allowed to hold more than 21% of their output in stocks by the end of September, and they should bring down stock level to 8% of output by October end. The intervention comes amidst rising sugar prices. The sweetener is currently selling at more than Rs 40 per kilogram, while the branded sugar is being sold at Rs 50 per Kg. The government hiked import duty last month from 40% to 50% to curb inward shipment and check price rise. To check rising onion prices, it asked state governments to hold de-hoarding operations and act against speculators and profiteers. Onion prices have soared from Rs 15 per kilo in July to Rs 28, while the increase has been much steeper in the metros. Onion is currently being sold at Rs 31 per kg in Chennai, Rs 38 per kg in Delhi, Rs 40 per kg in Kolkata and Rs 33 per kg in Mumbai. "After examining all the circumstances, Government has inferred that there are other reasons than shortage (of onions) contributing to the abnormal price rise like hoarding, speculation etc," an official statement said.



## Farmers to get licences for cold stores, warehouses

➤ The Haryana state government will issue licences to farmers to establish cold stores and warehouses in their fields to increase their income and also the shelf life of their produce. Chief Minister ManoharLalKhattar stated this while inaugurating a block of around 50 shops at the new vegetable and fruit market here today. "We are going to frame a new policy to link agriculture to warehouses and cold stores. Licences for both will be open for all," he said. It would also improve the economic condition of farmers, he added.



## Import Duty on Wheat may be Hiked to 20-25%

➤ The government is likely to raise import duty on wheat to 20-25% from 10% to curb cheap shipments and give positive price signal to farmers who will start sowing winter crop after the Diwali festival, an official source said. "Several discussions have been held on tweaking import duty of wheat. Currently, global prices are depressed and increase in import duty of wheat will be worked out accordingly. A final call will be taken soon," the source said. In March, the government had imposed 10% import duty on wheat to contain sharp fall in local prices in view of bumper crop of 98.38 mt in 2016-17 crop year (July-June).

## Centre extends MSP scheme to entire country

➤ In a bid to provide a wider platform to tribals to sell their produce, the government announced extension of the Minimum Support Price (MSP) scheme for Minor Forest Produce (MFP) to all the states in the country. Tribal Affairs Minister Jual Oram made the announcement regarding pan-India extension of the scheme — initially introduced in nine states in 2014 — during a National Workshop on Minimum Support Price for Minor Forest Produce here. The MFP could be the largest generator of revenue after minerals, he added. Oram emphasised on the use of social media and new technology to help the tribals sell their produces at best prices.

## Karnataka refuses to join eNAM over trade issues

➤ Karnataka, the first state to initiate reforms in agricultural commodities marketing, has refused to join the agriculture ministry-promoted national platform — electronic National Agriculture Market (eNAM) citing lack progress in allowing inter-state trade, seamless movement of goods across the country and development of uniform physical parameters for commodities trade. A joint venture special purpose vehicle — Rashtriya eMarket Services Private (ReMS) between the Karnataka government and NCDEX Spot, which



had electronically linked the southern state's 157 mandis, had reported a turnover of Rs 37,000 crore in 2016-17 while 244 odd mandis across 13 states linked through eNAM have so far achieved a turnover of Rs 28,250 crore since its launch in April, 2016. Stating that Karnataka has allowed traders from at least seven states including TN, AP, Maharashtra and Kerala to buy commodities across all the mandis linked through the Unified Market Platform, Manoj Rajan, managing director & CEO, ReMS said that there is no 'reciprocity' by other states to grant licenses to traders from outside, thus depriving the farmers from 'real price discovery'. ReMS provides an e-permit that facilitates the movement of commodities — pulses, oilseeds, copra, cereals within the state, replacing the manual permit system. The permit allows all 157 markets in the Karnataka to update their stock and generate e-permits from the UMP.



## Maha soyabean procurement under MSP likely from Oct 25

➤ The State Marketing Federation of Maharashtra has sent a proposal to the National Agricultural Cooperative Marketing Federation of India (Nafed) regarding opening 88 procurement centres in 23 districts of the state for the purchase of soybean under MSP (Minimum Support Price). Soybean is expected to be procured at these centres from October 25. Moong and urad will be procured under MSP from October 18. Registrations for cotton procurement will commence from October 15, said Sadabhau Khot, minister of state for agriculture in Maharashtra. Around 10 lakh quintals of soybean is expected to be purchased from farmers at these centres, officials said. Farmer registrations for procurement of moong and urad began from October 3. New centres are expected to be opened in a couple of days for the registration of soybean procurement as well. With the prices of soybean and pulses ruling below Minimum Support Prices (MSP), procurement of these commodities at MSP under the Centre's Price Support Scheme (PSS) procurement has been planned through Nafed.

## APMC Act: Maharashtra wants to delist pulses, oilseeds

➤ Enthused by the positive outcome of delisting fruits and vegetables from the ambit of Agricultural Produce Market Committee Act, 1963, Maharashtra has proposed the direct marketing of pulses and oilseeds. The State government has appointed a committee to study the pros and cons of delisting pulses and oilseeds and asked it to submit a report in three months, a senior official with the State Agriculture Marketing and Cooperation Department, said. The committee will be headed by Sadabhau Khot, Minister of State for Agriculture and Marketing and will have 16 more members, including Pasha Patel, Chairman of the State Commission for Agricultural Costs and Prices, the official said. Delisting pulses and oilseeds from the APMC Act will ensure remunerative prices for farmers. In July last year, the State had notified delisting fruits and vegetables from the purview of the APMC Act, paving the way for the direct marketing of these commodities by farmers.





## Centre urges states to make own plans to double farm income

➤ Putting the onus on states, Union Agriculture Minister Radha Mohan Singh asked them to chalk out individual strategies to achieve the target of doubling farmers' income by 2022. The minister said the Centre had come out with a four-volume report suggesting ways to boost farmers' income, which states could study and see how best it could be implemented. In a two-day national conference to evolve a sowing strategy for the rabi season, he said the focus should not only be on crop productivity, but also on allied farm activities like timber and honeybee cultivation. "The government's aim is to increase productivity and ensure farmers get the remunerative price for their produce," he said, recounting the schemes undertaken to achieve the target of doubling farmers' income. While implementing these schemes, he said, states should devise their own strategy to boost farmers' income by focusing on production-to-post-harvest activities. This puts the onus of achieving Prime Minister Narendra Modi's aim of doubling farmers' income by 2022 on states. In defence, ministry officials said agriculture was a state subject, hence the onus was also on them. Meanwhile, the Centre has also drafted a new "market assurance scheme", which will enable states to do agricultural market intervention at their own level. Officials said the state had been asked to study and share how they wish to implement the scheme.



## Maharashtra estimates sugar yield of 7.34 million tonnes this season

➤ India's top sugar producing state Maharashtra will begin this year's sugarcane crushing season from 1 November. A cabinet committee on sugar headed by chief minister Devendra Fadnis announced the date in Mumbai on Wednesday after a meeting with sugar industry representatives. This season Maharashtra estimates a sugarcane yield of 72.2mt and sugar production of 7.34mt, according to a press release issued by the chief minister's office.

## AP speeding up 28 irrigation projects

➤ The Andhra Pradesh government is taking all steps to speed up as many as 28 irrigation projects in the state, with special emphasis on the mega Polavaram project on the Godavari, in an effort to tackle drought, according to Chief Minister N Chandrababu Naidu. "It will carry water to Visakhapatnam through Yeleru canal and drinking water needs of the city and industrial water requirements will be met adequately, even before the completion of the Polavaram project," he said. He expressed confidence that Polavaram project will be completed by 2019, "but the Centre will have to reimburse Rs. 3,500 crore we have already spent on the project, as it is a national project," he said.



## Telangana govt verifying land records before start of farm subsidy scheme



➤ The Telangana government has started a survey to verify and update land records before the start of a farm subsidy scheme. The scheme proposes to give farmers input subsidy of Rs 4,000 per acre to buy fertilizers, among others. B.R. Meena, special chief secretary, revenue department, said the name of the person legally owning agricultural lands should be reflected in government records. He added that over 4,500 officials from the revenue and agriculture departments have been deployed to complete the task of verifying land records. The survey, which started on 15 September, will verify details and update land ownership data in 10,733 revenue villages in the state, said a revenue department official, who did not want to be identified. The drive is expected to be completed by 31 December and all the pattidars (land owners) will be issued new passbooks after verification, he added.



## Rajasthan waives farm loans

➤ Rajasthan has become the third BJP-ruled state, after Maharashtra and Uttar Pradesh, to waive farm loans. The government made the loan waiver announcement late on September 13 after reaching an agreement with farmers who had been agitating since September 1. Thirteen days of unrelenting but non-violent protests, road blockades and show of resilience forced the Vasundhara Raje-led Rajasthan government to agree to some key demands made by farmers in the desert state. The agitating farmers had put forth a list of 11 demands. They included a complete farm loan waiver, implementation of the recommendations of the M S Swaminathan Commission, the withdrawal of the 2017 ban on cattle trade, a solution to the menace of stray



cattle, and a pension for farmers. The Rajasthan government has agreed to a few demands, but will first form a high-

level committee to execute the solutions and to study the loan waiver process in other states.

## Commercial banks surpass farm credit target by 28%

➤ Commercial banks have surpassed the annual national target for agricultural credit by 28 per cent during 2016-17 while all other categories of banks underperformed, according to the RBI. The overall flow of credit to the agricultural sector, however, has exceeded the target at Rs. 10.658 lakh crore against the target of Rs. 9 lakh crore. In 2015-16, the target was Rs. 8.5 lakh crore while total disbursement was Rs. 9.15 lakh crore, the RBI said in its annual report for 2016-17. In FY17, the performance in total priority sector lending was flat in public sector banks at Rs. 19.89 lakh crore against Rs. 19.85 lakh crore in the previous year. In private sector banks, however, this went up to Rs. 7.11 lakh crore from Rs. 6.48 lakh crore, according to the report. Priority sector loans include small-value loans to farmers for agriculture and allied activities, MSMEs, to the poor for housing, and education loans. Social infrastructure and renewable energy are also eligible categories under this category. An important development during 2016-17 was the launch of priority sector lending certificates scheme as a mechanism to incentivise banks having a surplus to lend to different categories of the priority sector. A platform to enable trading in the certificates has been provided by the RBI through its core banking portal e-Kuber. "The PSLC platform recorded active participation from all eligible entities, including urban cooperative banks and small finance banks, during 2016-17," the report said.

## Farmers to get loan waiver reimbursement before Diwali



➤ Farmers in most of the districts in Maharashtra who have applied for farm loan waiver and where District Central Cooperative Banks (DCC Banks) have submitted the list of applicants to the administration, the loan reimbursement amount shall be deposited in their bank accounts before Diwali festival. Minister for Agriculture, Pandurang Phundkar stated that the government will release the funds to those districts where the DCC Banks have submitted the complete list of farmers. He added that some DCC Banks which have branches across the district are yet to send their complied list of farm loan waiver beneficiaries. Phundkar further clarified that the government had never announced complete loan waiver for farmers in the state.

## \$1 Billion in Credit Now Available for Sustainable Farming

➤ Rabobank, the Netherlands banking giant and one of the world's lenders to the global food and agriculture sector, today announced a \$1 billion credit program that seeks to launch more land restoration and forest protection projects worldwide. The overarching goal, insists Rabobank, is to scale up more sustainable food and farming practices over the next three years. The Netherlands-based bank currently claims it has over \$109 billion outstanding in loans across the global food supply chain. "We also aim to strengthen food chains by optimization and financing, by taking part in initiatives for sustainable food security, by stimulating public debate and by contributing to the innovation financing that is necessary," Rabobank states on its web site. In addition, the bank says it employs at least 80 researchers who regularly report on trends across the global food industry. The bank now wants to take its sustainable agriculture financing a step further with its "Kickstart Food" program. Partnering with UN Environment, Rabobank says its plan will focus on expanding finance options within four areas: food waste, soil restoration, resilient agriculture and nutrition



## Regional rural banks set to unlock value; listing of shares in the offing

➤ The country's capital market might see a new breed of banking entities go in for public listing. Regional rural banks (RRBs), promoted by public sector banks and Central and state governments, are coming out of the shadows of their sponsor banks — PSBs, which ironically are weighed down by huge bad loans and losses — to launch initial public offerings (IPOs) and list their shares. At least two RRBs — Andhra Pradesh Grameena Vikas Bank (APGVB) and Saurashtra Gramin Bank (SGB) — sponsored by State Bank of India (SBI) could be in line to raise capital through IPOs. "Two banks that are matured enough to go public are Andhra Pradesh Grameena Vikas Bank and Saurashtra Gramin Bank. Both are doing very well," said Dinesh Khara, managing director, SBI. RRBs, which were formed under the RRB Act, 1976, provide credit and other facilities to small farmers, agricultural labourers and artisans in rural areas. The Act was amended in 2015 whereby such banks were permitted to raise capital from sources other than Central, state governments and sponsor banks. Currently, 56 RRBs are operating in the country with total deposits of Rs 3,59,321 crore, advances of Rs 2,30,387 crore and 21,294 reporting offices as of June 2017, according to data from the Reserve Bank of India (RBI).

## Rs 3.45 cr disbursed under NABARD project in Nalbari

➤ The National Bank for Agriculture and Rural Development (NABARD) has implemented a pilot project on digitisation of all self-help groups (SHGs) in Nalbari district, Assam. In this regard, a portal named 'EShakti' has been launched by NABARD. Under this project, a mega credit camp was organised by the Central Bank of India (CBI) on the Nalbari Harimandir premises. A total of 215 sanction letters were distributed among the SHGs, amounting to Rs 3.45 crore in the mega credit and financial literacy camp. The camp was attended by Rajashree Kakati Baruah, Chief General Manager, NABARD, KU Viswanathan, General Manager, NABARD, M Ravindra Kumar Reddy, Deputy General Manager, NABARD, SP Dhal, Zonal Manager, Central Bank of India, SD Mangalkar, Regional Manager, Central Bank of India, Barpeta, Debajyoti Biswas, DDM, NABARD, Nalbari, and few others





## SEA-invest seeks partner to set up fruit terminal in India

► SEA-invest NV, the world's top fruit terminal operator, is weighing plans to set up a facility with an automated warehouse and cold storage near a port in Mumbai or Kolkata in partnership with a local firm – this will

enable the fruit terminal operator tap the huge potential in a market where fruits and vegetables worth thousands of crores go waste every year due to inadequate storage infrastructure. The Ghent, Belgium-based group, handles

over 5.5-million tonnes (mt) of fruits from its terminals located in Belgium, Germany, the Netherlands, Ivory Coast and South Africa. Of this, 1.5 mt is handled at the Antwerp terminal, its largest. SEA-invest has a temperature-controlled storage capacity of 620,000 square metres that can accommodate 176,000 pallets, and a storage facility for deep-frozen products (-20°C) of 132,000 cubic metres. It offers value-added services such as quality control, packaging, truck delivery, custom formalities and phytosanitary controls. The fully automated and computer controlled systems in its terminals can track and trace each good individually, from harvest to final delivery. SEA-invest is in talks with a Mumbai-based company for partnership, and is also taking the help of a Belgian firm to help enter the Indian market.



## Oilmeal exports up 85% in April-Sept

► Oilmeal exports in the first half of the current financial year grew by 85.35 per cent to 11.01 lakh tonnes (lt) aided by better domestic output and global prices. The shipments stood at 5.94 lt during the corresponding period last year. The Solvent Extractors Association of India, the apex trade body for the vegoil industry, said oilmeal exports have revived to some extent this year owing to higher output last year on account of good rains after two straight years of drought. The improving price parity in the world market has also boosted shipments. However, the shipments in the first half are still lower when compared to earlier years, said BV Mehta, Executive Director, SEAI. Oilmeal exports have risen on account of higher demand from countries such as Vietnam, South Korea and Thailand, among others. South Korea was the largest buyer in April-September this year, followed by Vietnam.

## Coffee exports brew 9.36% in 2016-17 marketing year

► Coffee exports from India, Asia's third-largest producer and exporter of coffee, rose by 9.36 per cent to 3,76,873 tonnes in the marketing year that ended September 2017, buoyed by higher global prices, according to state-run Coffee Board. The country's coffee shipments stood at 3,44,613 tonne in the 2015-16 marketing year. "Two factors contributed for higher shipments in 2016-17. Firstly, there was enough

domestic supply to meet the export demand as the domestic output was record in 2015-16. Also, global prices were better," a senior Board official said. As a result, coffee exports remained robust both in terms of volume and value in 2016-17, he said. According to the Board data, the export value realisation rose 7.31 per cent to Rs 1,64,284 per tonne of coffee in 2016-17 from Rs 1,53,089 tonne in the year-ago period. Total coffee exports in value terms rose to Rs 6,191.43 crore from Rs 5,275 crore in the said period, it added. The domestic supply was adequate as the output was record 3.48 lakh tonne in the 2015-16 crop year. Normally, robusta variety comprises 70 per cent of the total coffee exports, while the rest is arabica coffee. Major export destinations are Italy, Germany, Turkey, Russian Federation and Belgium, among others.





## Europe on the brink of sugar deluge as quotas end

► Europe is about to get a lot sweeter. After a decade of quotas, sugar firms in the European Union can now produce and export as much as they want. Companies such as France's Tereos and Germany's Suedzucker AG have been ramping up operations to get ready for the change, which will help fuel a global sugar glut. The scrapping of quotas — the last of the EU's agriculture curbs — may also lead to major changes in the global sugar trade. With increased EU production, there will be less need to import supplies from places like Africa and the Caribbean. The quotas that ended this weekend were set in 2006 in preparation to phase out limits that were first imposed in the 1960s to ensure food security were rejected by the World Trade Organization. Scrapping the restrictions will help the EU boost exports by almost 50 per cent to 2.2 million tonnes this season, according to the US

Department of Agriculture. EU sugar prices, which for years have traded at a premium to the world price, are set to move more in line with global rates, according to Rabobank. Average EU prices are at about €500 (\$590) a tonne, according to the European Commission. That compares with about \$361 a ton for white-sugar futures traded in London.



## India to export five lakh tonne rice to Bangladesh



► In a first of its kind arrangement between India and Bangladesh in recent years, India would be exporting around 5 lakh tonne of parboiled rice to Bangladesh for meeting its domestic demand and creating a buffer stock. The central government has authorised agri cooperative Nafed to export rice to Bangladesh. At present, Bangladesh is facing a shortfall of 1.5 million tonne (mt) of rice this year due to crop losses by heavy flooding in the recent months. Bangladesh's ministry of food has called a meeting on October 15 to decide on the prices and time-frame for supply of rice from India. As the rice exports would be carried on a G2G (government-to-government) basis, there would not be any tender for rice exports from India. Around 1.5 lakh tonne of rice has been already exported to Bangladesh by private trade this fiscal year.

## Edible oil import to rise in coming year



► India's dependence on imported edible oil is likely to increase to a record level during the coming oil year of 2017-18 (November-October). A decline in availability from domestic sources is expected, following lower oilseed availability and sustained increase in consumption. Data compiled by the apex industry body, the Solvent Extractors' Association, shows vegetable oil (98 per cent edible and two per cent non-edible) import at 14.27 million tonnes for the 11-month period ended September 2017, compared with 13.57 mt in the corresponding period last year. Another 1.2-1.3 mt of import in October would take the year's import to 15.5 mt, a record. As for the oil year 2017-18, less of sowing and crop damage due to flooding in major growing regions has reduced the soybean crop size. From last year's 12 mt, soybean output is forecast at below nine mt.

## India heading for another record in tea production

➤ Indications are that India is on its way to post another record production in tea this calendar year. Tea Board announced August production data, which shows a six per cent increase in the country's output over 2016 to total 167.98 mkg. North Indian output rose by five per cent to reach 148.16 mkg, while South Indian output increased by nine per cent to reach 19.82 mkg. Consequently, the cumulative production in the eight months has increased by 33.45 mkg or five per cent. This means that India is continuing the tradition of posting record production year after year. If this trend continues, the country will end up with a production of 1,300 mkg against 1,267 mkg produced in 2016, according to industry observers. The bulk of the increase has happened in South India where the production till August rose by 12 per cent to reach 156.39 mkg. North Indian output increased by three per cent to reach 610.33 mkg. Good rainfall has been instrumental in pushing up harvest in tea plantations across the country. Assam continues to top India's production table and in the eight months, the State produced 382.54 mkg, up two per cent over January-August 2016. Darjeeling was trailing behind last year with production falling to 2.07 mkg from 5.63 mkg.



## WDRA goes digital, paves way for paperless agri marketing

➤ The Union Food and Public Distribution Minister Ram Vilas Paswan paved way for paperless marketing of agricultural commodities by issuing the country's first electronic negotiable warehouse receipt (eNWR) to a farmer from Rajasthan. These e-receipts issued against agricultural produce that farmers have stored in warehouses registered with the Warehousing Development and Regulatory Authority (WDRA) offer multiple benefits to farmers. Apart from making it possible for farmers to sell their produce in mandis of their choice across the country, they can pledge the eNWRs in part or full to raise loans to meet their requirements. "More importantly, farmers availing such facilities do not need to resort to distress sale, which has been hitting farmers' income in the country very badly," Paswan said. The Minister also launched a portal set up by the WDRA which will allow warehouses across the country to register with the authority without any paperwork.



## New index to help investors gauge food diversity

➤ An EU-funded index measuring biodiversity in food production is expected to be launched next year, giving investors a benchmark for assessing how companies and governments are making food systems more resilient to climate change. Investing in food species such as drought-tolerant Ethiopian durum wheat or the frost-resistant Andean grain canahua can make food supply chains more resistant to climate shocks, according to research published by Bioversity International. Pre-agricultural societies used about 7,000 edible plant species but modern food systems rely on just 30 varieties to feed the world, and the most common crops make up just 2 percent of material stored in gene banks. Reliance on just a handful of species increases the risk of supply shocks as droughts, rising temperatures and unpredictable weather events become more common, according to the study by Bioversity International, a global research organisation. Its new research will form the basis of the European Commission-funded Agrobiodiversity Index, which is expected to be launched in late 2018 and will include concrete criteria for measuring progress towards greater agrobiodiversity.



## India's first APMC yard established with near-zero government assistance

► P PSojitra, chairman of the Amreli Agricultural Produce Market Committee (APMC), recently earned praise from Prime Minister Narendra Modi. The reason: the unique model of financing that the APMC employed in developing its new market yard at Fatehpur, a village on the outskirts of Amreli town. The new yard, costing Rs 125 crore, has 10 auction sheds of 25,000 square feet each, an open bidding space of three lakh square feet, 200 shops/offices, a well-appointed guest house, a farmer training centre, soil testing lab and produce grading facilities, underground cabling and storm-water drainage systems. But what sets it apart from other APMC-owned yards in India is its being built with hardly any state support or bank loans. Started in 1953, the Amreli APMC is the oldest in the Saurashtra region. The existing yard spread over six hectares has, over time, become the heart of Amreli town. And with rising crop arrivals, on top of vehicular population linked to the town's own growth, it has inevitably contributed to traffic snarls.



## Icrisat finds way to combat aflatoxins in groundnuts

► Aflatoxins, a poison produced by the *Aspergillus* fungus that grows naturally on food crops, is a hidden burden that is estimated to affect over 500 crore people. Daily intake of small doses could reduce immunity and stunt growth of children. A new study by a team of international scientists, including from the International Crops Research Institute for the Semi-Arid Tropics (Icrisat), brings in a ray of hope. It talks of double defence approach to reduce the toxin levels. "Using innovative biotechnology approaches, researchers have developed groundnuts free from aflatoxins," Kiran Sharma, Principal Scientist at the Icrisat, and co-author of the publication, said. This could mean a lot to farmers. Besides groundnut farmers, it will also benefit those growing maize, cotton, chillies and almonds. To boost the groundnut's immunity against the fungus, researchers developed peanut lines that are able to produce small peptides known as defensins, that are often produced as immune responses to pathogens by some plants, animals and humans. "By producing small proteins called defensins, these groundnuts can stop the deadly fungus from multiplying and infecting. At the same time, the groundnut seeds also emit gene-silencing RNA molecules to help shut down the synthesis of aflatoxin by the fungus," he said.

## UK's fully robotic farm completes first harvest

► An experimental robotic farm run by UK scientists has been harvested for the first time, yielding about 5 tonnes of spring barley. Everything from start to finish — including sowing, fertilising, collecting samples and harvesting — has been done by autonomous vehicles on the farm, researchers said. Researchers from the Harper Adams University in the UK believe that robotic technology improves yields in agriculture, which is necessary to avoid a food crisis with the growing population in coming years. For the project, dubbed Hands Free Hectare, researchers used commercially available agriculture machines and software used to guide amateur drones. "In agriculture, nobody has really managed to solve the problem of autonomy," said Jonathan Gill, mechatronics researcher at Harper Adams University, who led the project. The researchers purchased several small-size agricultural machines, including a tractor and a combine, a machine for harvesting grain crops, the 'Live Science' reported. They then fitted the machines with actuators, electronics and robotic technology that would allow them to control the machines without the presence of a human operator. "The vehicles navigate entirely based on the GPS, and they are just essentially driving towards targets that we predetermined," said Martin Abell, of Precision Decisions, an agricultural company that partnered with the university. "At different GPS targets, there are different actions designed to be carried out," Abell said. The Harper Adams team plans to use the robotically harvested spring barley to make a limited batch of "hands-free" beer that will be distributed to the project's partners.





# POWERING INDIAN FARMS

## AGRI MECHANIZATION CAN REVOLUTIONIZE INDIAN AGRICULTURE

Mechanization in Indian farms until a few years ago was considered an extravagance that could be done away with a few pair of working hands. The associated advantages were dispensable and were hardly considered as incentive. But the recent developments in Indian economy and policies have reduced the labour strength of Indian agriculture, which was in fact one of its strongest pillars, and has forced India to reinvent agriculture with farm machines and implements. Policies were crafted to familiarize and popularize farm machines amongst the larger farming community. Today farm mechanization has integrated into Indian agriculture, although not completely. Years to come will see palpable change in the way farm mechanization is perceived among farmers.





India with largest area under cultivation in the world over the years has become an important agriculture producer. Deriving its strength from crop diversity and varied agro climatic conditions suitable to grow a host of crops, Indian agriculture is vibrant and ready to take on its next stage of expansion. Still relying heavily on manual labour, most of the agricultural activities are therefore time consuming, imprecise, inefficient and most recently expensive. The exodus of the youth from rural areas to urban centers of development has made agriculture labour expensive and in effect raised the cost of production. The current wave of unsustainability in the agriculture practices have also demanded a more input responsive and efficient system of farming.

Farm Mechanization though has most often been considered as exclusive to larger tracts and wealthy farmers, have made inroads into the smaller farms. Smaller compact machines, custom hiring, subsidies and collective farming have made farm mechanization more accessible to Indian farmers. The recent times have seen better rate of adoption of farm mechanization, although the coverage is patchy and not inclusive. The changing times demand transition from muscle power to machine power, if agriculture has to continue rendering its responsibility of growing food. The demand becomes pertinent especially in the scenario of expanding populating and diminishing resources and the duty hence would be to guarantee efficient input use and resources.

#### **Farm Mechanization – Today**

India's dependence on animal and human power for agricultural activities is found to be declining. This has resulted in a shift from traditional agriculture to a more mechanized operation. 'Tractorisation' of Indian





farms was probably India's first step towards mechanization. Later on custom hiring centers popularized other equipments and machines. With government interventions such as subsidising purchase of equipment as well as supporting bulk buying through front-end agencies, providing credit and financial assistance to support local manufacturing of farm mechanisation equipment, adoption of farm mechanisation has seen much improvement.

Several indigenously developed agricultural tools and implements have also

evolved over time to comply with small farm sizes. They played a very important role as well. In 2010, when the size of the agricultural labour force was 269.74 million, the estimated number of hand tools in use was 809.22 million, which equates to about 3 hand tools per labourer.

Today farm mechanisation in India stands at about 40-45 percent. This is still low when compared to countries such as the US (95 percent), Brazil (75 percent) and China (57percent). While the level of mechanisation lags behind other developed countries, the same has seen strong growth through the last decade. The farm power availability on Indian farms has grown from 1.47 kW/ha in 2005-06 to 2.02 kW/ha in 2013-14.

In India, the level of mechanisation varies greatly by region. States in the north such as Punjab, Haryana and Uttar Pradesh have high level of mechanisation, as the regions were the front line states in the era of green revolution. The state governments in these states have also provided timely support in promoting mechanisation of farms. In contrast, the states in the western and southern region have traditionally maintained lower level of mechanisation on account of smaller and scattered land holdings. The north-eastern states on the other hand has extremely low level of mechanisation. Hilly





topography, high transportation cost, lack of state financing and other financial constraints due to socio-economic conditions and dearth of agricultural machinery manufacturing industries have hindered the growth of farm equipment sector within these states.

Operation-wise, the level of mechanisation varies from 42 percent for soil working and seed bed preparation, 29 percent for seeding and planting, 34 percent for plant protection and 37 percent for irrigation.

Market wise, tractors are the most popular and hence the largest segment in the equipment category with an annual sale of 600,000-700,000 units. Within the tractor market, the 41-50 HP segment is the largest selling unit, registering about 44 percent of the total tractor sales (domestic + exports) in FY'15. Next largest segment is the 31-40 HP segment, which has gained 2.2 share points in share of volume, which has been sourced mainly from the > 50 HP segment. While the country produces a large volume of tractors, it also exports tractor units to other countries across the world. On an average, the country exports 60,000 tractors annually. India's tractor export markets primarily include African countries and ASEAN countries where soil and agro-climatic conditions are similar to India. The major players in the market include, Mahindra & Mahindra, TAFE, VST, International Tractors, Force Motors and Escorts. The tractor market has grown at a CAGR of 15.2 percent till FY'14. However, there was a sharp downturn seen in FY'15. This has been attributed to a reduction in farm incomes due to the decline in production of major crops as well as softening commodity prices with lower procurements by the government on account of adequate buffer reserves. In the same time period, the tiller market grew at 10 percent. Between FY'08 and FY'13, the thresher and rotavator markets grew at 2.0 and 21.0 percent respectively.



### Why India Needs More Mechanization?

India has reached a stage where yield stagnation and population growth have joined hands. The yields across the traditionally growing regions are scarcely responding to the inputs and this has set the stage for an alarming situation. For a country that is all geared up to take its new role as an economic super power in the larger global arena, its food economy is equally crucial. Until a scientific breakthrough is materialized, the agricultural world is left with the option of making the best out of the situation. Currently the only way is to increase input use efficiency and keep the profession profitable by minimizing the cost of production.

Farm machines can play a significant role in making agriculture efficient and viable. Studies have shown a direct relationship between farm mechanisation and farm yield. Use of appropriate machines have found to save around 20% of seeds and increase yield by 15%. The same trend has been observed with fertilizers as well. Farm mechanisation can

**States in the north such as Punjab, Haryana and Uttar Pradesh have high level of mechanisation, as the regions were the front line states in the era of green revolution**



also help significantly in reducing time for carrying out different agricultural operations by approximately 15-20 percent. Notwithstanding its impressive advantages of improving the harvest and reducing the post-harvest losses, farm machines can considerably improve the quality of cultivation. The reduction in drudgery and time spent in agricultural operations can attract the youth towards taking up agriculture and improve its social standing. These benefits and the savings in inputs help in the reduction of production costs and allow farmers to earn more income.

Moreover, Indian population dependent on farm labour is fast diminishing. Today with immense opportunities from other sectors - factories and services and government's rural employment creation program,

there is considerable strain in the availability of labour for agriculture. Rapid urbanization has also been a significant factor in curtailing the popularity of farm labour. The trend is supposed to gain momentum in years to come. According to a World Bank estimate, over half of the Indian population would be urbanized by year 2050, a marked change from 2005 when only 29 percent of the population was urban. By 2050, percentage of agricultural workers of the total work force would drop to 25.7 percent from 58.2 percent in 2001.

One of the significant advantages of mechanization is the timeliness of the operation. Certain situations demand completion of agricultural operations timely to take advantage of the current climatic situation. For instance, in dryland agriculture, it is necessary to complete tillage operations as quickly as possible, to take the best advantage of the available soil moisture. High HP and high capacity equipment is required to complete the tillage and sowing operations quickly, preferably in a single pass. Dryland agriculture, often associated with poor productivity and use of animal draft power and conventional tools, can be modernized, provided relatively large tractors and matching equipment are promoted in these areas. Many regions in the country can be brought under agriculture, if machines are

deployed.

The income from agriculture is primarily dependent on cost of production. With the decreasing availability of labour, the labour charges have increased considerably. The increase in wages has become more real recently some even suggesting the wage increment from 4% to 8%. The future is not going to be any different. This brings us to the element of cost of production. Introducing machines in the long run can truncate the cost and improve the agricultural efficiency. Introducing farm machines can also to a large extent reduce drudgery and make the profession more attractive to youth.

### Automating Indian Farms

Considering the significant advantages the farmers and agriculture in general can enjoy with the introduction of mechanization in Indian farms, it becomes imperative to popularize it. However, Indian situation of farming which is dominated by small and marginal farmers with sparse capital resources can hardly manage to automate farming operations. But with some help from the government



and with suitable economic models, mechanization can be made a reliable partner in agricultural development.

Owning a single unit of farm machinery is definitely an impossible task considering economic prospects. So centers which can rent out the farm machinery emerges as a suitable and realistic alternative in Indian farming context. This allows multi machinery usage by a single farm. Custom hiring of farm machinery was introduced in Indian agriculture as early as 1912. The approach got further momentum with the establishment of Agro-Industries Corporations within the

**Owning a single unit of farm machinery is definitely an impossible task considering economic prospects. So centers which can rent out the farm machinery emerges as a suitable and realistic alternative in Indian farming context. This allows multi machinery usage by a single farm**







**Custom hiring centres give farm machinery on a rental basis to farmers who cannot afford to purchase high-end agricultural machinery and equipment, apart from servicing old machinery**

states. The government of India, through a centrally sponsored scheme promoted the establishment of 17 State Agro Industries Corporations (SAICs), one each in the major States of the country as joint ventures during 1965–70. The initial role played by these corporations has been primarily responsible for development of the infrastructural facilities in the States at district and subdivision levels. Custom hiring centres give farm machinery on a rental basis to farmers who cannot afford to purchase high-end agricultural machinery and equipment, apart from servicing old machinery. Farm machineries/equipment available at CHCs include tractor, rotavator, multi-crop thresher, MB plough, cultivator, leveller blade, blade harrow, seed cum fertilizer drill, knapsack sprayer, power weeder, winnowing fan, electronic balance, repairing tools. These units are generally located in close proximities to large and small land holdings, which supply machinery and equipment to villages close to it reducing transport cost and transportation time. Punjab, Haryana, Uttar Pradesh, Uttarakhand, Gujarat, Maharashtra, Karnataka and TN have maximum number of registered and unregistered CHCs and hence are the most mechanized states. In an effort to promote farm mechanization, the government has

made the establishment of farm machinery banks for custom hiring as one of the core components of the Sub-Mission on Agricultural Mechanisation (SMAM) and government provides financial assistance for setting them up. However, there is a need for enhanced participation from the private sector in setting up CHCs and capacity building.

The Government of India through several schemes and policies have tried to further enhance the spread of farm mechanization. Rashtriya Krishi Vikas Yojna (RKVY), Mission for Integrated Development of Horticulture (MIDH), National Mission



on Oilseeds and Oil Palm (NMOOP) and National Food Security Mission (NFSM) are the schemes that are intended to expand country's agricultural productivity. Provisions have been made under this scheme to adopt farm mechanization and hence the government has accorded an important status to the sector.

Under the National Food Security Mission (NFSM) launched in October, 2007, provisions for assistance (up to 50 percent the cost of machinery) have been provided for adoption of farm machinery such as pump sets, tractor mounted sprayers, seed drills, zero till seed drill etc. to varying degrees. Similarly, under the Mission for Integrated Development of Horticulture (MIDH), an important intervention is 'Horticulture Mechanisation' which aims to improve farm efficiency and reduce drudgery of the workforce. Assistance in this regard is provided for activities such as procurement of power operated machines and tools, besides import of new machines. Assistance is also available to grower associations, farmer groups, self-help groups, and women farmer groups etc. (with more than 10 members) that are engaged in cultivation of horticulture crops. 60 percent of the cost of machines will be borne by such groups. Mission on Agricultural Extension and Technology (NMAET)

also includes a Sub-Mission on Agricultural Mechanisation (SMAM) which is implemented in all the states to promote the usage of farm equipment and to increase the ratio of farm power to cultivable unit area up to 2kW/ha.

### **Farm Mechanization can be a challenging task**

Despite the apparent benefits farm mechanization owes to the farming in India, the automation hasn't caught up with the majority of farms in India. The reasons are multifaceted from being ignorance to poverty.

Indian agriculture, unlike the agriculture in developed countries lack scale. Average farm size in India is less than 1.15 hectares, which is far lower than regions like European Union (14 hectare) and the US (170 hectare). The average size of these holdings has shown a steady declining trend over various Agriculture Censuses since 1970-71. As much as 67 percent of India's farmland is held by the marginal farmers with holdings below one hectare, against less than 1 percent in large holdings of 10 hectares and above. This data is discouraging from the point of mechanization. Large farm machineries are difficult to operate on such land holdings, which in some cases are completely unsuitable. Another factor to

consider is mechanising small and non contiguous group of small farms is against economies of scale, especially in operations such as land preparation and harvesting. As land holdings get smaller, more and more farmers fall into the adverse category and therefore ownership of machinery becomes uneconomical.

Capital, another major restriction in India's farm economy, also caps the possibilities in terms of farm mechanization. Farm equipment and machines are generally capital intensive and involves heavy investment which are impractical for small farmers, who incidentally form the bulk of the farming community. Most of the farm machinery sale are done with the aid of financial assistance -almost 90 percent of the tractors sold in India are done so with the assistance of some financial institution. Apart from buying, the after-sales service of farm equipment and other recurring costs such as that of the fuel further dampens the prospects of farm machinery in India.

Purchasing agricultural machinery is not a simple affair in India especially if there are financial strings such as subsidies or loans attached to it. A farmer has to go through various levels/departments to get his land records verified. Post clearance, he has to go through further checks from the District Agriculture Officer in order to obtain approval and clearance for the purchase. This process itself becomes a big hindrance and discomfort to the farmer. Another issue is financing in the purchase of standalone implements. In the case of tractors all required details of the equipment such as engine number, chassis number etc. are available for recording in the loan statements, whereas in the case of the equipments the details are patchy. Hence, financial institutions insist on purchase of the tractor





along with other farm implements. This seems to discourage farmers from investing. Commercial banks must be encouraged to provide adequate financing for various farm equipment. This will help in curtailing the trend of tractorisation and promote a diversity in the use of farm equipments, so that India can observe a realistic growth in mechanization.

There is a lack of proper mandatory safety standards for use of machinery as well as absence of standardised norms to ensure quality of the equipment. As a result, there is no premium for the higher quality products, which leads to lesser incentives for manufacturers to invest in quality and new and cutting-edge technologies. Another problem the industry faces is the lack of data/ information. Also, there is a clear absence of farm machinery management data regarding use-patterns, annual-use, breakdown-frequency, repair and management cost, reliability, granular information on the extent/ penetration of mechanisation etc. In the absence of data, requirements of the scope of market growth remains unclear and often targets are missed. Some manufacturers also face issues of excise duties that need to be paid on intermediate parts such as higher-quality gear-boxes that are imported and used in assembling the final product. Therefore, even if parts are imported and assembled and used in the country, the manufacturers have to bear the cost.

### The Way Ahead

Farm mechanization undoubtedly remains India's bet on sustainable and profitable agriculture. But the prevalent situation of fragmented landholdings severely restrain India's farm mechanization. To adapt to our conditions, India should research and invest on machines that are amenable to Indian conditions. We



need machines and equipment to fit for the different regions of the country. We need to increase focus on commercialization of research done by various universities especially in this space.

Besides this, farmers must be made aware of the benefits of farm mechanization. The notion that farm machines and equipment are expensive should be dismissed and they should be introduced to economical concepts like collective farming, collective ownership, custom hiring centers, subsidies and schemes which make the use of farm machines economical and practical. Supporting the finance of second hand tractors can also help small farmers. Extension services to advise the farmer on suitability of various makes, models and horse powers for different size of land holdings need to be strengthened.

Mechanization is capital intensive and most of the farmers belonging to marginal and small categories find it economically not feasible to maintain the machines. The skewed and seasonal usage results in low economic viability. This calls for innovative solutions for scaling up usage. Custom hiring and collective farming are possible alternatives to this problem.

Although enough policy thrust is imparted on the prospect of mechanization in agriculture, there

are certain problem areas that are still left behind. Custom hiring, though exists, has to be promoted through legislative and structural framework.

Machines for land development, excavation for drainage channels, mulching, trench cutting and post hole digging are not commonly available. Fodder production, tree felling, pruning etc. are performed manually. In the absence of machines for such operations, even an assessment of their requirement is difficult. Limited introduction through importation may help in projecting their need and the likely future demand.

The future mechanization strategy may have to be based on agro-ecological diversity and economic disparity of the farmers. Rice mechanization, sugarcane mechanization, cotton mechanization, potato mechanization, horticulture mechanization, green house and covered cultivation, drip and micro irrigation are new emerging areas which need attention of Agricultural Engineering Institutions and industries for their development, production and marketing.

Farm mechanization has today become a necessity that India should aggressively pursue. The apparent advantages that it offers can take Indian agriculture to its next level and give farmers their due share in the profit.



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# “MACHINES PLAY A SIGNIFICANT ROLE IN MAKING AGRICULTURE SUSTAINABLE AND PROFITABLE”

Founded in 1913, CLAAS is one of the world's leading manufacturers of agricultural engineering equipment. The European market leader in combine harvesters, CLAAS is the world leader in another large product group, self-propelled forage harvesters. CLAAS is also a top performer in world-wide agricultural engineering with tractors, agricultural balers and green harvesting machinery. CLAAS entered India 25 years ago as a joint venture with Escorts and introduced the concept of mechanized harvesting. CLAAS brought in harvesters and 10 years later, CLAAS is a leader in this segment, selling over 1000 combine harvesters annually across the country, with the market accommodating 3500-4000 units. In an interview with Agriculture Today, Mr. Mrityunjay Singh, Managing Director, CLAAS Agricultural Machinery Pvt. Ltd., discusses the current farm mechanization scenario in India.

## How mechanized are the Indian farms?

Overall India enjoys mechanization of about 40-45% of fields, with most concentration in the state of Punjab and Haryana. Other states such as UP, Orissa, Bihar, Rajasthan, and West Bengal have a low concentration of mechanization and have scope for further strengthening.

## How equipped are Indian farmers to use modern agricultural machines and implements? How can their skill potential be improved?

Even though Indian farming community is quite receptive to modern farming technology, it is still linked with output and revenues. Thus, it is one area where we have to work extensively before we miss the bus. The government and private sector have to join hands to spread awareness about the benefits of modern agricultural machinery. At the same time, initiatives have to be taken to impart necessary training to farmers so that they can enjoy maximum benefits from the machines. For eg., there is a dire need to train farmers on operating Rice Transplanters and Forage making



machines. Such machines hold great importance in times of expensive and scarce labour. Our Prime Minister's Skill Development Program is the right step in right direction. CLAAS in India is also seizing the opportunity wholeheartedly and contributing in this initiative by opening several Training Academies on its own or in collaboration with Government Agriculture Universities.

## Has Indian farming moved beyond tractorisation? Which are the next line of farm machines that are popular now?

Tractors still constitute the major portion of overall farm mechanization level in India. Agri-machinery manufacturers in India continue to focus on tractors while the investments to develop new machinery is still low when compared to other developing economies. In spite of the present situation, farmers have started to enjoy increased access to a wide range of machines over the past decade and it is encouraging to see that progressive farmers across the country are making investments in the same. These include rice transplanters, combine harvesters, forage harvesters, balers, and hay making machinery amongst others. Transplanters are used to

transplant rice seedlings which reduce time and effort required as compared to manual transplanting. Theoretically in India, a million transplanters can be used, but the concept is new and will take time to reach its full potential. Transplanters are being increasingly used in South India (rice bed)- starting with Tamil Nadu and spreading into



Andhra Pradesh, Karnataka and Kerala. Combine harvesters are versatile machines that combine separate processes of reaping, threshing and winnowing into a single operation and have been efficient in harvesting crops such as wheat, rice, soybean, oats, sorghum amongst others. Combine harvesters- which CLAAS brought to India over 25 years ago, with its CROP TIGER series, has become one of the most popular and widely accepted machines. Similarly, Forage harvesters are being used to harvest Maize and converting them into silage which is used to feed livestock. Balers compress raked crops such as straw and forage into bales that makes it easier to transport. They are becoming increasingly popular in South India to convert straw into bales that can be transported to biomass plants. Punjab has the potential to adopt more balers and tackle the problem of stubble burning. Last year, CLAAS introduced straw walker technology where machines pick up straw, and threshes it. The farmers use this to create bioproduct of straw which is worth Rs 10,000 per acre. CLAAS' DOMINATOR series is used for this, and balers pick it up easily. Hence, there is a wide array of machines that can be used to improve efficiency of farming.

### **What role do agri machines play in making agriculture more sustainable and profitable to the farmers?**

Machines reduce time and efforts required in the process of farming, as compared to manual operations. Hence, they play a significant role in making agriculture sustainable and profitable. Moreover, with shrinking farm size year after year, the viability of the whole agriculture practice is being tested. Hence, more and more farmers are trying to incorporate rental model for separate source of revenue. For example, Combine Harvesters, Forage Harvesters, and Balers by CLAAS are increasingly being purchased by farmers turned entrepreneurs and they have reported profits within 2-3 years of investment.

This is a sustainable and profitable model for all. Even smaller machines like Rice Transplanters, Hay making machinery, tractor mounted forage harvester etc. are becoming very popular among farmers because of low investment and high returns and that too within a short span of time.

### **Stubble burning has been cited as a reason for worsening air quality in the region? Is there a solution that mechanization can provide?**

The problem of stubble burning is only in paddy when both wheat and paddy are harvested by the same combines. This is because farmers haven't found an economically viable solution of using the straw left after wheat. It is fed to cattle but paddy straw has no sustainable use yet. Even if the paddy is harvested manually, there will always be straw left behind and here the solution of using it for biomass has seen to be viable. From a mechanization point of view, we recommend investments in balers which helps putting stubble into bales which can be transported easily to the 7 biomass plants in Punjab. Hence, the only solution to stubble burning is finding an economical way of using it. If used for biomass, at least 70% of the straw will be well used. The little remaining can be disposed off better when the field is being prepared for next sowing.

### **How is the agri machine market in India? Is Indian agriculture ready to absorb more machines into the fields?**

Use of proper equipment can increase the farm productivity by up-to 30 percent and reduce the input cost by about 20 percent. This is an incentive for Indian farms to absorb more machines into the fields. Currently, India has mechanisation levels ranging between 40-45% which is far less than other BRIC countries such as Brazil and China. Reports and studies have also established that Agricultural machinery market in India is estimated to be growing at a CAGR of over 10% currently which establishes India's

potential to increase mechanization.

### **How conducive are the government policies towards popularizing agricultural machines in India?**

There is an opportunity to encourage more diversity in machines, to move beyond tractors. In Punjab (where mechanization levels are highest), Govt has the opportunity to support balers that can be used to collect paddy straw for the biomass plants. They used to subsidize purchase of balers 2 years ago but stopped it. Governments of Karnataka and Madhya Pradesh are quite encouraging as they have rolled out the custom hiring model for farmers to rent machinery and benefit from it even though they can't invest in the same. I feel the Government of Andhra Pradesh is also very progressive, as they are incentivizing investments in forage harvesters so that the dairy industry flourishes. In Orissa, Government has taken steps to encourage mechanization as the levels of mechanization in the state are quite low. With Government's aim to double farmers' incomes by 2022, there is no choice but to encourage mechanization to improve farm yield and reduce cost of production.

### **How bright is the future of farm mechanization in India? Do you see the likes of precision farming being practised in India?**

Certainly. Innovation in agriculture- in the form of big data analytics, new forms of seed breeding, drones and precision farming, is already being implemented across the world. In India, the application of the same is sporadic because of limitations in resources and abilities. It is imperative that all players- Government, private companies, startups and individuals provide assistance to farmers so that they can adopt these technologies immediately. Increasingly, farming requires us to make informed decisions, which is possible only through advent of innovation and application of science and technology in the entire chain- from harvesting to marketing.



# "GREAT SCOPE FOR FARM MECHANIZATION"



Mahindra Farm Equipment Sector (FES) is the world's largest selling tractor brand, by volumes and India's No.1 tractor maker for more than three decades now. The only tractor company to have won the Deming Prize and Japan Quality Medal, Mahindra FES rules the farms across all continents with presence in more than 60 countries globally. Through a string of global tie-ups, Mahindra is well poised to take on the future. In an interview with Agriculture Today, Mr. Rajesh Jejurikar, President, Mahindra Farm Equipment Sector discusses the farm mechanization scenario of India.

## Where does India stand in terms of farm mechanization?

These are great times for the Indian farm equipment industry, estimated at approximately USD 6.5 billion. In India, the level of mechanization is about 40-45 percent. Tractors account for most of the farm mechanization in India. Our country is also the largest tractor market in the world. ICRA states, "over the long term the CAGR

estimate for the tractor industry is 8% to 9%". Farmers are increasingly investing in high-end equipment to improve farm productivity, labour efficiency, quality of cultivation and to reduce post-harvest losses.

## What are India's advantages in introducing farm mechanization?

It is expected that food demand in

India would increase significantly in the coming decades, thanks to the large population and income increments, expanding urbanization and dietary changes. To meet this demand there is a great need to adopt technologies and improve productivity. Currently, India achieves 50-60% of its potential yield in most crops. One of the main reasons is lower technology adoption. There exists great need for arable land

in India and this can only be done with farm mechanization. Clearly, there is great scope for Farm Mechanization to grow. Our products like YUVO which aims to deliver More, Faster and Better, available across 5 HP points (30 to 45 HP) and caters to 70% to 80% of the industry. Products like these can help farmers complete farm operations faster, thus enabling multiple crops in a year, and hence promoting farmer prosperity and development of Indian rural economy.

### **How is it possible to introduce farm machines and equipment in small farm holdings?**

Over the years area under marginal and small operational land holding has gone up. Small & marginal land holding creates great opportunity for lower hp range of tractors. Another trend is the increased adoption of Horticulture. The area under Horticulture has increased by 36% from 2006 to 2016. With this change, there is a great need for tractors and implements that support horticulture based applications like spraying and intercultural operations. Today, making right product available to the farmer is possible with the wide range of financing options available. Especially NBFCs like Mahindra Finance, top tractor financier in India with over 1000+ branches with its local expertise and great customer understanding has strived to deliver the best products to the farmers across India.

The govt. too has kept its focus to make farm machinery available and affordable through Custom Hiring. Custom Hiring Centres (CHCs) is a major component of the government's 'Sub-Mission on Agricultural Mechanization (SMAM)' policy. At Mahindra, we launched a new farm machinery rental service TRRINGO. We are making farm machinery accessible to small and marginal farmers by digitally empowering them. Whenever farmers need a tractor or any other equipment, they can simply call Trringo, or use its mobile app and place their order. They

will receive a well-maintained tractor along with a professional operator with utmost ease. Trringo commenced its operation in Sept 2016. It is currently present in 5 states and has reached more than 1 lakh farmers. More than 58,000 farmers are registered on this platform.

### **How can farm mechanization help in doubling farm incomes?**

As labour for agriculture is getting more expensive especially during the peak seasons, a lot of farmers are finding mechanization highly profitable. Mechanization allows for higher quality in agricultural operations from land preparation to harvesting. It helps in increasing productivity reduced wastage and input optimization. Mechanization maximizes output and thus leads to great profits for the farmers.

### **Past green revolution, what changes do you see in the farm machinery segment in India? Is it still tractorisation or have we moved beyond it?**

Over the years, agricultural sector in India has moved from a traditional agriculture in the 1950s to the modern technologically advanced and capital-intensive agriculture. The first age of Indian agriculture from 1947 to 1966, what we would now like to call Farming 1.0 witnessed the land reforms and initiation of irrigation projects. The second age which we would like to call farming 2.0 was ushered in by the Green Revolution which resulted in self-sufficiency in cereals by significant improvement in yields. Technological innovations have the ability to transform every link in the value chain from farm to fork. Precision Farming is something that has taken roots globally but has eluded India. So now the time has come for us to move forward at a much faster pace and usher in the third age of farming which is Farming 3.0. Farming 3.0 will be defined by a new generation of

farmers, innovators, scientists, policy makers and professionals looking to balance productivity and economics with social and environmental considerations. Farming 3.0 will mean high farm productivity and minimal wastages, integrated value chains, technology platforms that connect farmers directly to consumers, data driven advisory, digital platforms for effective knowledge dissemination, integration of cloud computing & IOT in farming, smart farm machinery like autonomous tractors, drones & sensor based hi tech applications, robust irrigation infrastructure for more crop per drop, aggregation in farming through FPC's, competitive markets that provide better prices to farmers, an enabling environment that supports innovation, and increased collaboration between the private sector and other stakeholders. We aim to deliver Farm Tech prosperity through Farming 3.0. Our focus through Farming 3.0 will be on providing Smart Farm Machinery, Precision Agri Practices, Digital Platforms, Custom Hiring and Ecosystem Connect.

Our innovative and technology-led products introduction recently are testimony to our contribution under Farming 3.0. With our recent launch, we are the pioneers in making a driverless tractor. It has features like Auto Steering, headland turn & skip passing, implement lift, obstacle detection and avoidance, Geofence lock, auto start & stop and easy remote operations. It helps to get uniform row to row spacing, eliminates wheel lock for turns, easier & safer handling of implements, eliminates health hazards and improves productivity. The driverless tractors will be commercially available in 2018. It will be available across its range of tractors from 20HP to 100 HP over a period of time. Also, it will be deployed across international markets such as USA and Japan, giving Mahindra tractors a distinct competitive edge in global markets with technological advancement being at the forefront.



Mahindra Digisense, a revolutionary digital solution that connects Mahindra tractors to a whole new dimension of tractor ownership is a smart technology solution from us, which enables Mahindra tractors owners to be in complete control of their tractors 24x7 through the simple touch of a smartphone. It empowers customers to track, receive alerts & monitor health of their tractors anytime, anywhere, enabling them to improve productivity and profitability.

We believe for farming 3.0 to succeed, farmers, agri institutions, state and central governments, scientists, private sector and markets need to work in unison. Mahindra will be happy to play a major role in powering this drive of Farming 3.0..

### **Considering Mahindra's formidable presence around the world, are there any learnings that Mahindra would want to implement in India?**

We have set an ambitious target to make Mahindra a global brand. We aim to target the \$150 Bn global farm equipment opportunity of which 90 Bn is the non-tractor market. The aim is to cater to the entire farm value chain i.e., to go beyond just tractors. With the new strategy, which includes organic as well as inorganic growth we expect the share of non-tractor farm equipment business revenue to grow to 20% by FY19. By FY19, we also expect the global operations to account for 50% of the total revenue of the division, from 30% in 2015. We acquired 33% stake in Mitsubishi Mahindra Agricultural Machinery, Japan in May 2015 to cater to global rice value chain and 35% stake in Sampo Rosenlew, Finland in March 2016 to address the global combine harvester business. Another strategy is to utilize our existing presence in the global markets i.e. USA and Japan to expand our network. Through this we recently entered the Mexico and Brazil markets. We have chosen these markets carefully, understanding its current and future farming potential. We have strengthened our position in Turkey. The partnership with Hisarlar will help us address global range of soil preparation implements. And the partnership with Erkunt will help us expand our footprint in Turkey. All these deals will help us get into new segments and geographies.

### **What is the secret behind Mahindra's astounding success in the tractor segment?**

At Mahindra, in order to cater to this growing demand we have brought in innovation in

the way we reach out to our customers. We have worked on many aspects from product positioning, advertising; to the way we explain the sales story on the ground. We aim to deliver FarmTech prosperity to farmers across the world to help them to Rise. We play an important role by establishing in-depth relationship with them, by understanding their environment and their challenges so that we can offer tangible solutions. Understanding these evolving requirements, we have launched 3 new tractor platforms in the last 3 years. Mahindra Arjun Novo in 2015, Mahindra Yuvo in 2016 and Mahindra Jivo in 2017. Arjun Novo is a technologically advanced tractor with futuristic features in the >50 Hp category. The next product launched, Mahindra YUVO, caters to 5 products in different HP segments and targets 70% of the tractor industry. It is probably the only launch in the tractor industry spanning across a wide range of 30 – 45 HP segment. In FY18, we launched Mahindra JIVO, a new age, superior technology small tractor platform in the sub 25HP category. It is suitable for row crop and horticulture farming and has been designed keeping in mind the latent needs of this specialized farming segment and is an ideal choice for the farmers owing to its narrow and compact build and high power. It is also available in unique two tone red & silver sheet metal which is equipped with our Mahindra DiGiSENSE technology which enables farmers to get updates on their tractors' performance as well alerts on a real-time basis. Our Customer Value Proposition (CVP) for both our brands has helped us to define various initiatives for our customers. We are much beyond just selling machines to farmers; we work towards making a farmer more holistically aware about the mechanization solution that goes with it, and the overall solution around farming. To further enhance the consumer experience, we have also introduced tablets for our dealer salesmen. Apart from the technological changes we have also put in effort to train our sales team and have worked on the whole customer experience side. We are working to strike the right balance between using technology and building the right emotional connect. Another important factor that supports our success in India is our strong channel network. We have worked on strengthening our channel as a part of positioning ourselves as technology leaders. We have been revamping our dealership network to make them more tech savvy. Mahindra and Mahindra has strong network of > 1600 dealers in more than 4 lakhs villages of India.



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# NUTRIENT FILM TECHNIQUE



**N**FT (Nutrient Film Technique) is a modern hydroponic method that involves the usage of a shallow film of nutrient solution to flow past the plant roots. NFT is the growing of plants, bare rooted in long, waterproof channels, down which flows a very shallow stream of re-circulating water, into which are dissolved all the minerals required to grow healthy plants.

## Evolution of the NFT System

The idea of NFT was conceived and born at The Glasshouse Crops Research Institute in the mid 1970's in England, led by Dr. Allen Cooper and his team of horticultural scientists. The concept is described by Dr. Cooper as follows: "A very shallow stream of water containing all the dissolved nutrients required for growth is recirculated past the

bare roots of crop plants in a water tight gully..... Ideally, the depth of the recirculating stream should be very shallow, little more than a film of water – hence the name nutrient film. This ensures that the thick root mat, which develops in the bottom of the gully, has an upper surface which, although moist, is in the air. Consequently, there is an abundant

supply of oxygen to the roots of the plants ".

The fundamental basis of NFT is that the nutrient solution flows down a covered gully in a thin film (1mm deep). A thin film is essential as it allows much of the oxygen required by the plant to be taken from the air above the roots. The roots form a dense mat in the channel, and



because roots grow into those of the adjacent plants, the whole mat becomes an anchoring point, just as if they were planted in soil, no plant movement. The shallow film of liquid flowing under the roots ensures a permanent supply of water and minerals. The upper surface of the root mat, although moist, is in the air. This ensures a permanent supply of oxygen. There are 3 important factors to consider with NFT systems:

### Gradient (or Slope)

The angle at which the trough is placed is very important to the way that the nutrient solution flows. Normally the slope is created during the setup of the system by placing the channels in a framework or on benches, or even on a sloping floor. Drain fittings, channel joints and even imperfections and depressions on the surface of the channel can cause fluid to gather in puddles. So, although a very shallow gradient (say 1:100 – 1%) is theoretically considered to be best, in practice probably look at a slope of 1:30 (3.33%) or even 1:40 (2.5%).

### Flow Rate

The rate of flow of nutrient solution dictates how much of the dissolved nutrients are available to plants. It also, in conjunction with the gradient, dictates the depth of nutrient solution at the bottom of the channel, and this is key to the success of the system. As the name suggests, the system only requires a thin film of nutrient solution to work effectively. As a rule of thumb, a rate of 1 liter per minute should be a target flow rate. When introducing new plants to the system, this need to be reduced to around 500 ml per minute. At the other extreme, an upper limit of 2 liters per minute should be adhered to.

### Length of Channel

The actual maximum length of the channel will obviously depend on



factors such as flow rate, gradient and number of plants. The length of the channels has an important effect on the oxygen levels of nutrient solution. If the channel is too long the oxygen content of the solution will become depleted by the time it reaches the end of its run. As a rule it should not exceed 30 – 40 feet. Flow rates would then obviously need adjusting so that the minimum and maximum flow rates are not exceeded at any point in the system.

### Advantages of NFT

- Lower water and nutrient consumption.
- Avoids the supply, disposal and cost problems associated with media based systems.
- Relatively easy to disinfect roots and hardware compared to other system types.
- Absence of medium makes it easy to inspect roots for signs of disease, feed adequacy, etc.
- Regular feeding (and associated flushing) prevents localized salt build-up in the root zone and maintains uniform root zone pH and conductivity.
- Environmentally friendly - minimal potential for localized ground water contamination.

### Disadvantages of NFT

- Pump failure can result in plant death within a few hours, especially in hot weather.



- Not suitable for plants with large tap-root systems (e.g. carrots).
- Compared to run-to-waste systems, it is less suitable for saline (salty) waters because the salinity of the recirculating water gradually increases.

### Future for NFT

In the future it is possible for all commercial hydroponic growers to make a 'living' supplying consumers with what they want, at a price that everybody is happy with, and without polluting the environment. Clean, pure water is becoming a scarce commodity in the world, recycling Hydroponic systems use a fraction of the water that soil growers have to use, and waste products are much less, and easier to dispose of. Areas where drought is a problem and food is scarce, Hydroponic growing makes more economical use of what water is available.

Nutrient Film Technique hydroponics is an advanced hydroponics system that is often used by the commercial horticultural industry and is proven to provide excellent results. NFT systems require careful monitoring and fine adjustments to get right. However, once all the correct factors are dialled in, they can be relatively of low maintenance.

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# COMPOSTING

## A CHAMPION OF SOIL FERTILITY



India is an agrarian country. The crop production has been increasing due to improved agro technologies among the farmers. The agricultural activity is aiming to produce more and more food or useful produce. Huge quantity of farm waste is also generated in the process of farming. The quantum of farm waste generated is roughly more than 1000 million tonnes. All the waste has some nutrient value. But the waste cannot be utilized as such in the field. The transformation of farm and other biomass waste into plant nutrients is known to mankind for centuries as composting. Composting is an effective way to convert the waste material

(mainly used for landfills) to valuable product. There are many innovations that have been made in the process of composting to improve process as well the output quality. Therefore, today's methodology of composting can help many of the world's agricultural and waste management challenges. It is an alternative, supplement to the chemical fertilizers.

Composting is observed in various formats like backyard compost to large scale commercial compost. However, composting is an ancient technology, practiced even today. Use of manure for crop production was well documented in ancient Indian literatures like Vedas. Traditionally,

composting is done by piling organic materials until the next planting season, at which time the materials would have decayed enough to be ready for use in the soil. The improper understanding of composting may lead to immature compost formation and application, thus causing several issues like termite infestation, temporary nutrient deficiencies, increase in soil borne disease, poor crop growth, etc.

Composting is not a rocket science. A farmer can make composting in his own farm. He can also modify the raw materials used, process of turning, aeration, watering, addition of microbes, etc., with his understanding. Composting

is the natural organic matter decomposition process through microorganisms under controlled conditions. Under this, organic matters have been broken down through the action of aerobic microbes and the heat they produce and then subsequently built up into humus. Raw organic waste materials such as crop residues, animal wastes, food garbage, even municipal wastes and suitable industrial wastes can be used as composting material. It may be also made from farm waste like sugarcane trash, paddy straw, weeds and other plants and other waste is called farm compost. The compost made from town refuses like night soil, street sweepings and dustbin refuse is called town compost. This type of composting material enhances suitability of compost for application to the soil as a fertilizing resource. The nutrient contents of compost varies with types of raw material used, method and duration of composting. However, the average nutrient contents of compost are 0.5 per cent N, 0.15 percent P<sub>2</sub>O<sub>5</sub> and 0.5 percent K<sub>2</sub>O. The nutrient value of farm compost can be improved by adding superphosphate or rock phosphate at 10 to 15 kg/t of raw material at the starting of composting.

The microbes facilitating composting requires four key nutrients to work effectively: 1. Carbon: it is required as energy source. Heat is produced by the process of microbial oxidation of carbon. 2. Nitrogen: is essential to grow and reproduce more organisms to oxidize the carbon. 3. Oxygen: is utilized for oxidation of carbon during the process of decomposition. And 4. Water: is necessary in the right amounts to maintain better activity, excess of water may favour the anaerobic composting.

The compost can be made by placing farm wastes in heap/trenches of different sizes, preferably, 4.5 m to 5.0 m long, 1.5 m to 2.0 m wide and 1.0 m to 2.0 m depth/high. Farm waste is placed in the trenches/heap layer by layer. Each layer is well moistened by sprinkling animal dung slurry/urine or water. Trenches are filled up to a height of 0.5 m above the ground level. Normally the compost is ready for use within five to six months.

**Composting process:** Composting is facilitated by different biota namely earthworms, nematodes and soil insects such as mites, sowbugs, springtails, ants, and beetles which initiate the breakdown of complex organic macromolecules into simple compounds by the process of grinding or chopping. Soil microbes enter in the composting process once congenial physical environment is established. Soil bacteria, fungi, actinomycetes and protozoa develop their colonies by consuming the organic material and the composting process is geared up. Composting process can be divided in to two phases for better



understanding:

**Active phase:** Under this phase, the temperature of compost pile increases rapidly to 55-65°C within 24-72 hours of piling of organic material. This increased temperature of compost pile remains for several weeks. During this phase only thermophiles (microorganisms that sustain at temperatures above 45°C) are active and participate in the process of decomposition and humification of organic matter at later stage. During this phase the pathogens, eggs, and other insects or unwanted seeds are destroyed due to high temperature and by the activity of thermophilic microorganisms. However, chances of addition of seeds of unwanted plant and weeds can be reduced by covering the compost with cover.

During this phase the composting material becomes slightly acidic at the start of composting as the initial products of breakdown are the simple organic acids. After few days, the pile turns slightly alkaline as proteins are attacked by bacteria and ammonia is released (alkaline in reaction). Care must be taken as high alkalinity will encourage loss of nitrogen as ammonia; therefore, lime addition is not advisable at this stage. This can be reduced by adding approx 1% of total heap weight soil at the time of piling. Turning of piles and better aeration also helps in prevention of loss of ammonia. Whereas, if high acidity is developed during initial stage, it will prevent pile to warm up and the population of thermophilic bacteria will remain at sub-optimal level.

**Curing phase:** Once the active composting phase recedes, temperatures of pile starts declining and hover around 37°C. Now it is the turn of the mesophilic microorganisms to strengthen their colonies in the pile. Technically, the compost is considered to enter into the curing phase. During curing, complex organic molecules continue to decompose into simple compounds and finally biologically stable humic substances is formed as the major end product of composting. The composting



process is over and the final compost is ready. Maturity of compost is defined as the degree of humification (conversion of organic compounds to humic substances, which are most resistant to microbial breakdown). The composting time depends on the raw material used for composting, method of composting, environmental condition and management.

The most efficient composting occurs with an optimal carbon:nitrogen ratio of about 10:1 to 20:1. Rapid composting is favored by having a C/N ratio of around 30 or less. Surprisingly, the composting can be done in both the environments viz., aerobic and anaerobic. Aerobic composting is the most efficient. Although the atmospheric air contains 21% O<sub>2</sub>, aerobic microbes can survive at around 5% oxygen concentration, while more than 10% oxygen concentrations are considered optimum for compost piles. The microbes oxidize carbon for energy by utilizing oxygen and producing carbon dioxide as by-product. As microbial activity increases in the compost pile, more O<sub>2</sub> will be consumed and required for efficient composting. Without sufficient oxygen supply, the process will become partially anaerobic or anaerobic, and consequently produce foul odors. Therefore, the composts must be aerated either passively or actively by any means to keep aerobic organisms active. Turning of compost piles or supplying oxygen through aerated water or direct aeration through air pipes are some common methods for aeration of compost piles. Turning of compost piles gear up the composting process.

Some fertilizers like Zinc sulphate, iron sulphate, rock phosphate, mica etc. are used to enrich compost and add value to compost quality. Some microbial inoculation and some small quantity of nitrogenous fertilizer or previously developed well decomposed compost is also used as activator of composting process.

## Why compost should be used:

- Compost has a unique property

to improve the soil health (chemical, physical, and biological characteristics of soils).

- The humus of compost can hold water to several times its weight and release slowly. Hence, in arid region the use of compost can reduce irrigation requirements which could be reflected by the increased crop yield.
- Compost has property to increase water retention and water adhesion. Therefore it is suitable for light soils.
- Compost application reduces soil bulk density and improves soil structure by binding the soil inorganic colloids with organic matter and formation of stable aggregates. Compost application also improves soil infiltration and porosity. Therefore suitable for heavy soils.
- Increases the water-holding capacity of the soil directly by binding water to organic matter and that way improving the absorption and movement of water into the soil.
- Adding compost to soil increases the cation exchange capacity of soil which help more cations retained on the soil surface and helps in reduction in fertilizer requirements.
- Compost promotes more microbial diversity, soil becomes microbially charged and help in suppression of soil-borne pathogens.
- Compost is known to accelerate the breakdown of pesticides and other synthetic organic compounds as well as the reduction in bioavailability of heavy and toxic metals. This gives an opportunity to use compost to reclaim various degrees of soil pollution.
- Compost has a positive influence on crop production; it provides slow and steady supply of essential plant nutrients to the crop and helps to increase the yield.
- Compost also contributes to an increase in crop yield by influencing germination, grain protein content, crop quality, insect pest and disease resistance.
- Long term fertility experiments

also establish the effectiveness of compost in maintaining soil fertility.

- Compost also helps in reduction of soil, water and wind erosion.
- Compost may be a substitute or supplement to the chemical fertilizers.
- Compost also provides plant hormones, enzymes, chelating agents, antibiotics, other growth substances, which may be beneficial for crop growth and soil fertility.
- These characteristics of compost make it a valuable input to counter the odd effects of climate change on crop production. Also compost offers a solution to many of the world's agricultural, environmental, and waste management challenges.

## Challenges of using Composts

The nutrient value of compost is low compared with that of chemical fertilizers, and the rate of nutrient release is also slow. Therefore it cannot usually meet the nutrient requirements of fast growing crops at peak nutrient requirement time, resulting in some nutrient deficiency but it is very useful in lawn, vegetables, horticultural crops, medicinal crops, floriculture, and problematic soils, etc. The major challenge of compost is its inconsistent nutrient composition compared to chemical fertilizers. The possibility of presence of heavy metals and other possible contaminants in compost when city municipal waste is used as raw material is limiting the use of compost for agricultural use. Therefore, there is need to popularize mechanized approach to composting speedy and hygienic utilization of agro wastes as well as city waste. Also the law to regulate the quality of compost is much awaited to ensure uniform and flawless benefit to the commercial compost user.

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# EXPANDING AGRI-EDUCATION REQUIRES QUALITY IMPROVEMENT



**A**gricultural Education (AE) has expanded tremendously during last twodecadeswithopening of new universities and colleges in public and private sectors but without commensurate increase in faculty and facilities resulting in significant decline in its quality.

## Present Scenario

The number of agricultural universities which was about 35 towards the end of the previous century has doubled during the last two decades. There are now 75 agricultural universities including 5 deemed to be universities, 3 central agricultural universities and 4 central universities with agricultural faculty. Of these, 15 universities are exclusively for veterinary and animal sciences, 5 for horticultural and forestry, one for dairy and 3 for fisheries education. The Mayee Committee constituted by the ICAR has reported in 2014 that in addition, there are 159 private agricultural

colleges affiliated to State Agricultural Universities (SAUs) and 51 such colleges are constituents of or affiliated to general universities. There is also one recently opened private agricultural university at Bangalore. A number of upcoming private universities are also opening up avenues for AE. About 28000 agricultural graduates are being produced every year. A study jointly conducted by National Academy of Agricultural Research and Management (NAARM) and Institute of Applied Manpower Planning (IAMP) in 2010, revealed that by 2020 the annual out turn required would have to be 54000. The existing demand supply gap of about 26000 is yet to be met in coming three and a half years leaving still scope for further expansion.

## Declining Standards

So far only 58 agricultural universities have been able to secure limited or full accreditation from the Indian Council of Agricultural Research (ICAR). Out

of about 30 thousand graduates appear for ICAR-NET, less than 20 per cent only clear it every year. Low quality of education is further evident from the fact that out of large number of institutions, only seven (IARI, New Delhi; TNAU, Coimbatore; PAU, Ludhiana; TANVASU, Chennai; AAU, Anand; GADVASU, Ludhiana and YSPUHF, Solan) could make their place among the top 100 in overall category and eight (eighth being RAJUVAS, Bikaner) in top 100 in university category in the list of National Institutional RankingFramework (NIRF) - 2017. Feedback from stakeholders reveals that graduates turning out from relatively new institutions are largely unemployable having no or scanty practical experience, skill and industrial exposure to meet emerging market needs.

## What is Ailing the System?

Agriculture including agricultural education is a State subject. Unfortunately, there is no uniformity in





exercising options by different States. A number of States are setting up new universities as well as splitting up the established universities in to specialised universities without matching budget resulting in insufficient investment and severe financial crunch in both old as well as new universities.

The system is badly suffering from declining number as well as quality of teachers. Majority of the faculty have been unable to cope up with the fast advancements in frontier areas because of extremely reduced library consultation, evaporated reading habits, limited exposure to refresher courses and advanced trainings as well as promotion without examination. Extensive 'sons of the soil' approach has reduced academic rigour and vigour, much needed to ignite passion for excellence in students and teachers. Lack of adequate modern tools of management, evaluation, monitoring and accountability is widely prevalent.

There is little interest and awareness on the importance of agricultural education in our youth which is reflected in extremely low (0.3%) gross enrolment. Knowledge deficient

weak outturn is primarily resulted from poor farm and library facilities, obsolete laboratory equipment, insufficient infrastructure, outdated curriculum and its delivery particularly in new and emerging areas like agri-nanotechnology, agri-informatics and information technology and absence of quality assurance mechanism. It is more rampant in private colleges. It is intriguing that how certain colleges and universities which have come up after barely fulfilling the condition of having minimum of 25 acres of land within and 35 acres outside the municipal limit (plain regions) and 10 and 25 acres respectively in hilly areas, can meet the minimum standards of the ICAR which prescribe requirement of 75 acres (plain regions) and 40 acres (hill, island and coastal regions) of land for an agricultural college for demonstration and learning practical field skills. But such institutions are offering agriculture courses with impunity because approval of the ICAR is not mandatory as is for other professional courses.

### Initiatives Required

The ICAR should be the sole apex

body to regulate agricultural education in the country enabling it to exercise similar powers as of other regulatory bodies like Veterinary, Medical, Dental and Bar Councils of India. It will result in observing the minimum standards prescribed by ICAR for starting and running agricultural courses and ensuring the implementation of quality assuring mechanism. The ICAR accreditation should be more objective and mandatory also for non-grant private institutions. All the agricultural colleges must be affiliated to agricultural universities rather than to general universities. Some States like Rajasthan, Maharashtra, Tamil Nadu and Chhattisgarh have already taken lead in doing so.

To enhance applicability and relevance of AE, there is need to strengthen it at secondary level also particularly in rural areas to increase inflow in universities and colleges from such areas. Graduation in agriculture should be recognised as a professional degree to make it more attractive for youngsters.

Tagging of first six SAUs, each with one university in USA in the nineteen sixties proved extremely

fruitful in terms of capacity building of faculty, preparing high quality human resource essential for teaching and research and firmly establishing the new Land Grant Colleges system in India. On similar pattern it will be prudent that under a special scheme the lagging universities may be tagged with SAUs which have figured in upper 100 in NIRF ranking which is expected to yield similar results as that of Indian and US universities attachment programme.

As per the NAARM-IAMP 2010 report, to meet projected annual additional requirement of 7153 horticultural experts by 2020, the Union Government has sanctioned 10 central research institutes and 10 national research centres in horticulture for different States. There should be no delay in establishing these institutes fully funded by the Centre, instead of setting up new horticultural universities by splitting up the existing agricultural universities.

State Agricultural Universities are largely dependent upon government funding. However, they must focus also on internal resource generation such as consultancy services, tuitions, alumni contributions, earn while you learn scheme, competitively selected extramural research and education projects, patents and special courses for mid-career professionals. SAUs can develop tie up arrangements with interested private colleges and universities to extend laboratory, field and library facilities by charging part of the fee of involved students deposited with the private institutions. Upper category SAUs may also generate resources through selling AE by becoming destination for students from African, SAARC and other countries.

Punjab has always remained a leading state in Agriculture as well as imparting good quality agricultural education. The state should not lag behind in granting PAU as affiliating university status and bringing agricultural education under its umbrella similarly as medical education under Baba Farid University of Health Sciences (BFUHS), veterinary



education under Guru Angad Dev Veterinary and Animal Sciences University (GADVASU) and technical education under (Punjab Technical University (PTU). It should prioritise setting up of the union government sponsored Post Graduate Institute of Horticultural Research and Education to Punjab. Certain States have established State level statutory regulatory authorities to improve weak outturn from private institutions. Establishing Punjab Council of Agriculture Education by the Punjab Government is a welcome step. Similarly, notwithstanding pressure from any lobby, the government should immediately pass the Bill on the Punjab Education Institutions (University and Colleges) Regulatory Authority. It will greatly help streamlining the system prevailing in private institutions and improving the standards of higher education including that of AE.

The Bhubaneswar Declaration on Indian AE (2013) an outcome of the National Academy of Agricultural Sciences and ICAR initiative emphatically says that "human capital should be seen as the greatest national treasure. Attracting talents to agricultural education, faculty competence improvement, addressing faculty shortage, reducing inbreeding, linkage among institutions



and assurance of quality agricultural education are fundamental to achieving the desired quality human resources." To achieve it therefore, it is utmost necessary that expansion should be adequately supported by consistent and predictable investments with sufficient flow of funds to attract best talent and blooming young minds. Implementing ICAR schemes like Student Exchange Programmes between colleges and universities located in different agro- climatic zones, establishing demonstration-cum-production centres for skill development and Student READY (Rural and Entrepreneurship Awareness Development Yojna) will help to produce more employable agriculture graduates.

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# Pulses in India: Current Scenario, Limitations and Prospects



## The global scenario

Pulses are important sources of nutrition and income for millions of farmers around the world and the main source of protein for the vegetarian community in many countries. However, the consumption of pulses has seen a slow but steady decline in both developed and developing countries. Globally, in comparison with dairy and meat products, no major changes are foreseen in per capita consumption of pulses, which is low at 7kg/person/year. Despite low consumption, in many countries including India, the population growth rate exceeds farm output, i.e. farmers cannot grow enough pulses to keep up with increased demand and are forced to import pulses.

According to FAO, the Green Revolution led to massive gains in yield and production of many basic foodstuffs. Between 1960 and 2011, crops such as maize, wheat, rice, and soy had cumulative production gains some where between 200 and 800

percent while pulses expanded by only 55 percent.

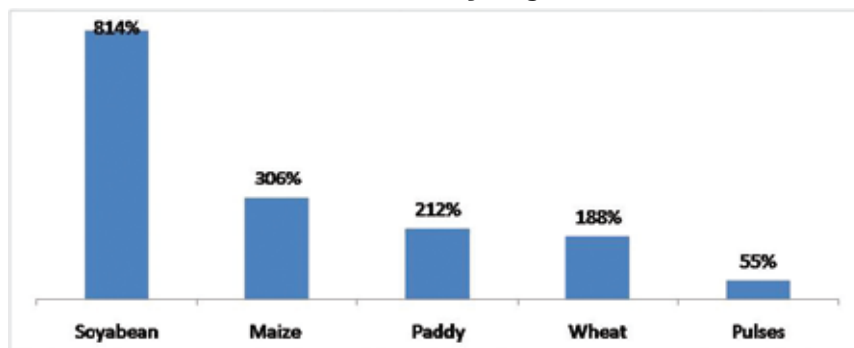
## The Indian scenario

In spite of having the largest area and production of pulses, India suffers the most because India has more vegetarians than the rest of the world combined—roughly a half-billion people.

For several decades after India's independence, until 2008, the production of pulses remained almost

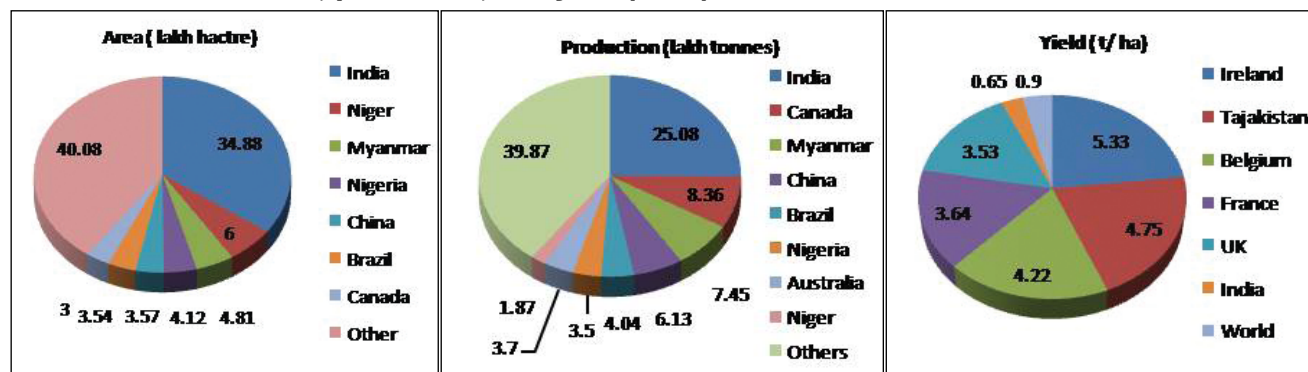
static—in the range of 14 million tonnes. In 2013–14, India produced 19.25 million tonnes of pulses, which a year later was only 17 million tonnes, necessitating more imports. In 2015–16, India imported 5.79 million tonnes pulses, which made India the largest importer of pulses in the world. In the last five years, except 2013–14, the import rose from 14.09 percent in 2011–2012 to 26.46 percent in 2015–16. With the continuous increase in demand for pulses in India,

## Growth rate of selected commodity at global level



Source: FAO, 2017

## Global scenario in area, production, and yield (2013)



Source: Government of India, 2016

the import has increased to 72.33 percent in that period. At the global level, India has the largest area and production of pulses but a productivity of only 0.65 t/ha, lower than the world's average of 0.9t/ha. The low productivity and increasing demand continues to increase the volume of annual imports.

Deficit production and increasing imports necessitate serious action to promote pulse cultivation at all levels especially in rain-fed regions. Approximately 60 percent of the total cultivable land in India is rain-fed and could be effectively utilized, saving as much as INR 25,691 crore, the value of total pulse imports in 2015–16.

### Limitations

Major constraints for the cultivation of pulses include the availability of desired quality and quantity of high-yielding seed varieties of pulses. Many new high-yielding varieties were developed in the past two decades, but their performance is limited to providing 10–20 percent high yield vs. local varieties. Due to inherited weaknesses, performance of these varieties is poor at the field level, and the moderate increase in yield does not attract farmers or make any significant change in the national level of production. The need is to develop varieties with better yield advantage and desirable characteristics that are best suited to a semi-arid climate.

The ever decreasing pattern of shrinking land holdings discourages farmers from growing medium to long-duration varieties, which occupy

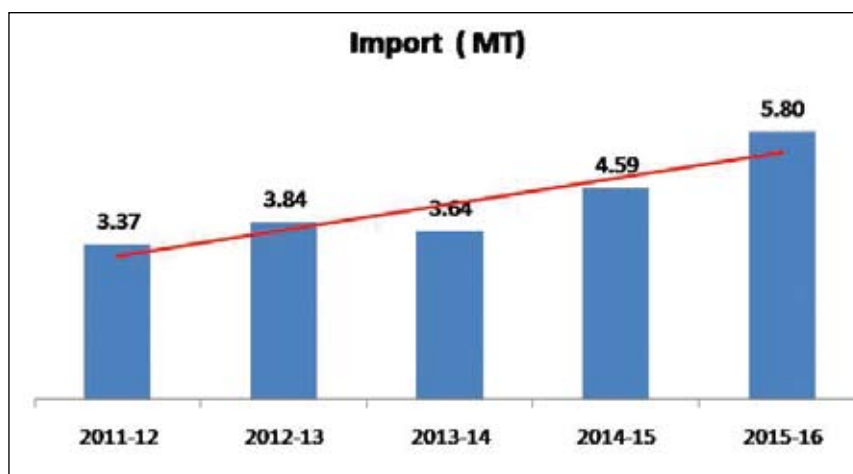
land for 240–270 days. Medium and long-duration varieties don't allow farmers to grow a cereal crop such as wheat and paddy, which provide a minimum cash income and year-long food security of the family.

Traditionally, fertilizer use in pulses is very low. Except soybean, most pulses are of lowest priority to farmers to use recommended quantity of fertilizers. The average use of chemical fertilizer to pulses results in low yields. For the growth and development of root nodules, phosphorous is absolutely necessary and the application of 40 kg P<sub>2</sub>O<sub>5</sub> average per hectare has been recommended. With the withdrawal of subsidies on fertilizers, the decline in the use of non-nitrogenous fertilizers has an adverse impact on yield.

The final testing ground of any technology is in the farmer's field.

Evidence suggests that the 100 percent requirement of nitrogen can be met to activate the nodulation process through the inoculation of efficient strains of rhizobium when coupled with sound agronomic practices. However, studies show that the adoption of these biofertilizers is negligible. Many farmers claim that inoculation with rhizobium is not providing the desired level of response. Rhizobium inoculation is probably not very effective in pulses. If this technology was as efficient as claimed, it wouldn't have to be "pushed" even now by government agencies as there would be enough demand by this time. Sustained use of rhizobium inoculants in the long run seems to be difficult. Of course, strict quality control standards need to be enforced in the manufacture and sale of the inoculants.

### India pulse import



Source: IPGA website



High incidences of diseases and pests cause high losses that result in low production and high protection costs. The spread of several resistant/tolerant varieties in the farmers' fields is very limited. The main reason could be the weak seed production program. The incorporation of insect-resistant genes, without compromising the yield in field verification trials, is yet to be commercially viable. Chemical pest control is the only option left for farmers at present for effective control of pest and diseases.

Even though several plant protection chemicals with method and time of application have been developed, the use of pesticides in pulses is still very low. In general, farmers apply chemical spray at the stage where losses cross the economic threshold level. This clearly shows that technological stagnation is primarily responsible for the backwardness of pulses in the country as a whole.

Market prices are largely controlled by local buyers irrespective of minimum support price (MSP), and procurement of pulses by the government agency is very limited, such as wheat and paddy. A government panel has called for procurement of pulses on a "war footing" as prices decline, and suggested better incentives for farmers in the form of higher minimum support prices combined with effective procurement to increase domestic availability and prevent price spikes. The government has suggested procuring pulses at MSP whereas local market trends show that the rate offered by local dealers is much below the MSP. Therefore, pulse growers are skeptical about the influence of MSP on actual market prices.

### Prospects

Pulses are an important source of high-quality protein complementing cereal proteins for the substantial vegetarian population of India. Pulses can be produced with a minimum use of resources and hence become less costly than animal proteins. Cultivation of pulses builds up a mechanism to fix atmospheric nitrogen in their root nodules and thus meet their nitrogen requirements to a great extent. Pulses

Food	Gm protein/100 gm	Food	Gm protein/100 gm
Bajra	11.6	Kidney bean	22.9
Rice	6.8	Soybean	43.2
Wheat flour	11	Ground nut	25.3
Bengal gram	20.8	Chicken	25.9
Black gram	24	Mutton	21.4
Cow pea	24.1	Milk ( buffalo)	4.3
Lentils	25	Milk ( cow)	3.2
Peas green (dry)	19.7	Green pea	7.2

can provide a sustainable solution in rain-fed area which occupies 67 percent net sown area, contributing 44 percent of food grains and supporting 40 percent of the population. Development and cultivation of more drought-tolerant varieties of pulse can save India's food and nutritional security.

Pulses are the most suitable crops to grow in water-stressed regions. Pulses require less water, improve soil health, and suit the local micro climate for smart agriculture. Only forty-three gallons of water (one gallon equals 3.785 liters) are required to produce one pound of pulses, whereas wheat, rice, and meat require 660, 1,056, and 1,142 gallons of water respectively. Therefore, in rain-fed farming systems, the cultivation of pulses, considered as smart crops, can help address climate change in agriculture. In comparison with resource-intensive crops such as wheat, soy, paddy, and maize, pulses are more remunerative crops due to fewer input needs and high market value. In addition, pulses improve soil health by fixing atmospheric nitrogen and adding humus content to the soil, which improves the soil's biological, chemical, and physical properties.

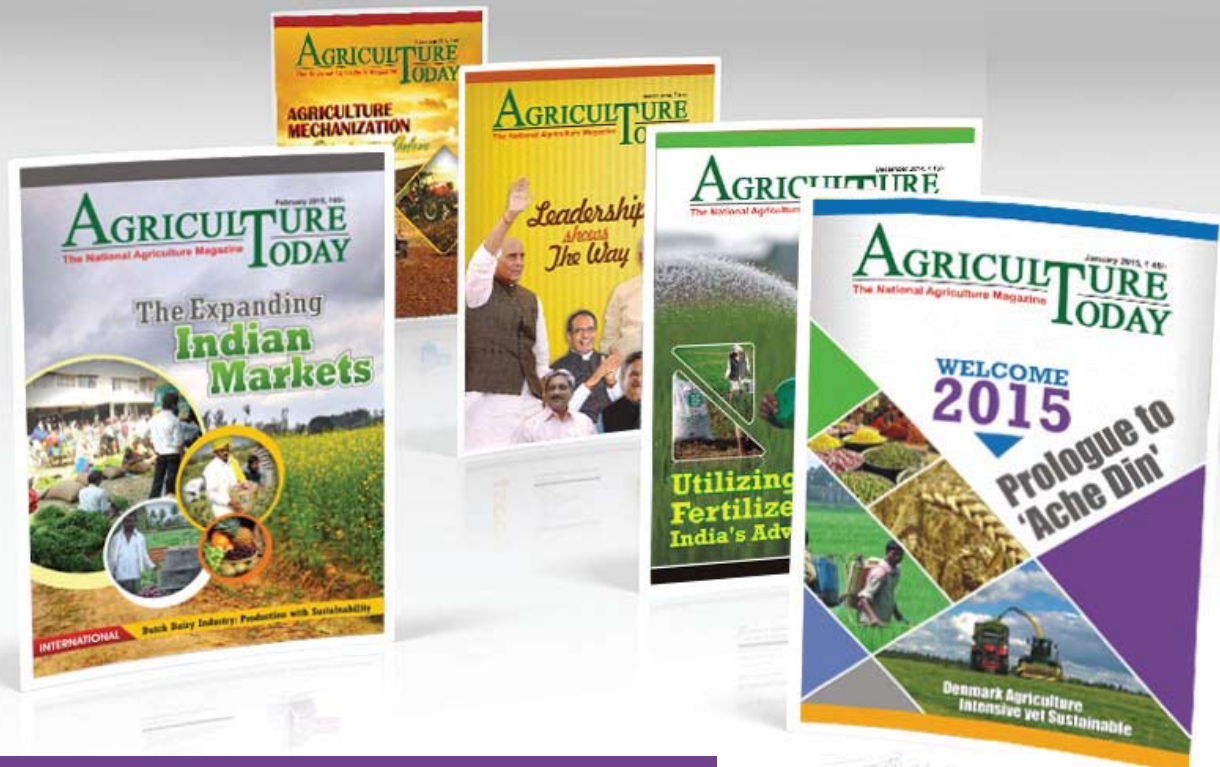
In rain-fed farming systems, pulses can improve overall farm income by introducing short-duration varieties of pulses into existing crop rotations. A pilot study done by Sehgal Foundation (NGO based in Gurugram) with thirty farmers of district Nuh confirmed that a short-duration variety of pigeonpea provide 229 percent (Rs 35,843/ha) higher profit than pearl millet. The high return demand for promoting pulses in rain-fed areas provide

opportunities for small land holders to shift from subsistence farming to profitable farming. The BCR and ROI of pigeonpea are 3.82 and 2.82, whereas for millet the BCR and ROI are 2.41 and 1.41. The high BCR and ROI of pigeonpea indicate that this is a more profitable crop than millet.

Traditionally, Indians have pulses, especially dals, as an important part of their daily diet, and pulses are the only sources of protein for more than half of the vegetarian population. Proteins are required to grow new cells and tissues, thus are essential for all and especially for growing children.

As can be seen in the table above, non-vegetarian food sources contain good amounts of proteins and, as India has a large vegetarian population, they can derive needed proteins from pulses and legumes. Pulses can be excellent sources of proteins in our diets. According to the Indian Market Research Bureau (IMRB, 2015) survey, which was conducted by interviewing 1,260 Indians, protein consumption in the diet of adult Indians (nine out of ten Indians) is less than their daily protein intake. The survey noted that 91 percent of the vegetarians and 85 percent of the non-vegetarians were protein deficient. The reason for this can be attributed to changes in eating habits and lifestyle. The tremendous increase in pulse prices also contributes significantly to this deficiency. Therefore, the mass-scale promotion of pulses is needed to enhance the income and nutritional security in rural and urban India.

**Pawan Kumar, Sehgal Foundation**  
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# COCONUT - THE TREE OF LIFE

**T**he coconut tree, a member of the family Arecaceae (palm family) and the only species of the genus *Cocos* are known for their great versatility, as evidenced by many traditional uses, ranging from food to cosmetics. They form a regular part of the diets of many people in the tropics and subtropics. Coconut palms are grown in more than 90 countries of the world, with a total production of 61 million tonnes per year. Most of the world production is in tropical Asia, with Indonesia, the Philippines, and India accounting collectively for 73% of the world total. Traditional areas of coconut cultivation in India are the states of Kerala, Tamil Nadu, Karnataka, Puducherry, Andhra Pradesh, Goa, Maharashtra, Odisha, and West Bengal and the islands of Lakshadweep and Andaman and Nicobar. As per 2014-15 statistics from Coconut Development Board of Government of India, four southern states combined account for almost 90% of the total production in the country: Tamil Nadu (33.84%), Karnataka (25.15%), Kerala (23.96%), and Andhra Pradesh (7.16%). Other states, such as Goa, Maharashtra, Odisha, West Bengal, and those in the northeast (Tripura and Assam) account for the remaining productions. The coconut palm is grown throughout the tropics for decoration, as well as for its many culinary and nonculinary uses; virtually every part of the coconut palm can be used by humans in some manner and has significant economic value. When coconuts are matured, they can be used as seed nuts or processed to give oil from the kernel. The oil can be used for cooking, prevent hair damage and moisturize the skin. The coconut also has cultural and religious significance in certain societies, particularly in India, where it is used in Hindu rituals. Like other fruits, coconut has three layers: the exocarp,



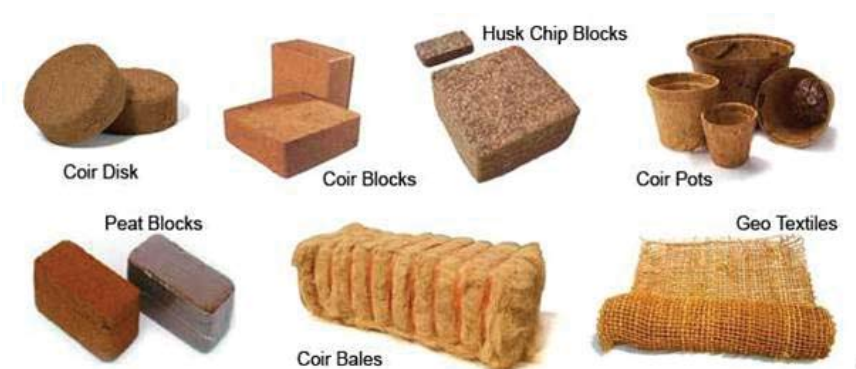
mesocarp, and endocarp. The exocarp and mesocarp make up the “husk” of the coconuts. Coconuts sold in the shops of nontropical countries often have their exocarp (outermost layer) removed. The mesocarp is composed of a fiber, called coir, which has many traditional and commercial uses. The shell has three germination pores (micropyles) or “eyes” that are clearly visible on its outside surface once the husk is removed. The coconut palm is known as the tree of life because it provides some of the basic necessities for humans and its endless uses. The palm not only provides a source of food and water but is also used for shelter, fuel and raw materials.

## Traditional utilization of coconut husk and shell

**The husk:** This is the rough exterior of the coconut which is made up of the coir (tough fibres). The dry weight of husk in each nut is about 0.3 kg. Almost 1.2 million tonnes annually is utilized for making coir. Back in the days when there weren't any scouring pad to wash the dishes, the locals used the coir with sand to clean their pots. It gave quite a shine to the utensil. For families who could not afford mattresses, the fibre was used as stuffing to make homemade mattresses. A dried half coconut shell with husk can be used to buff floors. It is known as a bunot in the Philippines

and simply a “coconut brush” in Jamaica. The fresh husk of a brown coconut may serve as a dish sponge or body sponge. A coco chocolatero was a cup used to serve small quantities of beverages (such as chocolate drinks) between the 17th and 19th centuries in countries such as Mexico, Guatemala, and Venezuela. The coir (the fiber from the husk of the coconut) is used in ropes, mats, door mats, brushes, and sacks, as caulking for boats, and as stuffing fiber for mattresses. Coconut husk has got the capacity to absorb nutrition and give them to the plant stably. Coconut husk decompose very quickly and give good soil enrichment to the plants. It is used in horticulture/forest as potting medium/compost, especially in orchid mix and to produce healthy forest tree seedlings. Other properties of coconut husk which are vital to keep up the plants are supply adequate moisture to the plant, plant doesn't get much wet which is harmful, balance mineral without exceeding, maintain good temperature for plant, maintain good pH value for plant, reduce fungal growth in plant, 100% natural production and popular as a potting medium for lower cost too. A fresh husk contains more tannin than old husks. Tannin produces negative effects on sapling growth. In parts of South India, the shell and husk are burned for smoke to repel mosquitoes.

**The shell:** Coconut shell is the strongest part covered in coconut fruit. Coconut shell is located in between the coconut flesh and coconut husk. This shell is naturally created to protect the inner part of coconut. Today this is mostly thrown away after extracting the flesh. It makes a great charcoal replacement. The shell which is quite strong is also used by artisans to create long-lasting handicrafts. The husk and shells can be used for fuel and are a source of charcoal. Activated carbon manufactured from coconut shell is considered extremely effective for the removal of impurities. The coconut's obscure origin in foreign lands led to the notion of using cups made from the shell to neutralise poisoned drinks. The cups were frequently engraved



*Various products made from coconut coir*



*Various products made from coconut shell  
(A: activated carbon, B, C and D: various handicrafts)*

and decorated with precious metals. In Asia, coconut shells are also used as bowls and in the manufacture of various handicrafts including buttons carved from dried shell. Coconut buttons are often used for Hawaiian aloha shirts. Tempurung, as the shell is called in the Malay language, can be used as a soup bowl and if fixed with a handle - a ladle. Half coconut shells are used in theatre Foley sound effects work, banged together to create the sound effect of a horse's hoofbeats. Dried half shells are used as the bodies of musical instruments, including the Chinese yehu and banhu, along with the Vietnamese đàn gáo and Arabo-Turkic rebab. In the Philippines, dried half shells are also used as a music instrument in a folk dance called maglalatik.

The coconut husk and shell are the by-products of coconut cultivation. Coconut husk is being used as a raw-material to produce ropes, mats, coco peat, door mats, seat cushion for automobiles, brushes, and sacks, as caulking for boats, and as stuffing fiber for mattresses. The coconut shell is largely being used as a raw material for production of activated carbon. Other than that, many artisans are using these to create long-lasting handicrafts. The husk and shells can be used for fuel and are a source of charcoal.

**Shrinivasa D. J., Paradkar V. D. and S. M. Mathur, College of Technology and Engineering, Udaipur and Shrutthi D. J., Maharani's Science College for Women, Mysore**



# MUSHROOMING OPPORTUNITY IN MUSHROOM BUSINESS



**M**ushroom cultivation has an immense scope in today's Indian food culture. Due to shrinking of agricultural land, industrialization and population pressure, mushroom has become one of the options of cultivation as they do not require land and may be carried out even under household condition. This is also women friendly job and can be done by women along with routine household work. It may also be taken as an enterprise which does not require much capital and skilled labour. Therefore, it can be well adopted by poor, small and marginal farmers, farmwomen, landless labourers, rural unemployed youth and even retired or in-service personnel. In India, at present, four mushroom varieties viz., button mushroom (*Agaricus bisporus*), Oyster Mushroom (*Pleurotus* sp.), (*Volvariella* sp.) and milky mushroom (*Calocybe indica*) have been recommended for

year round cultivation.

Marketing of fresh mushrooms in India or even all over the world is not yet organized except the auction system in Netherlands. Producers make direct efforts to bring the produce to the upper markets and 'wholesale distributor' element is mostly missing. However, trade in the processed (canned and dried) category is sizeable and organized. Per capita consumption of mushrooms in India is less than 50 gm as against over a kg in various countries. There has not been any serious effort to promote the product, to strengthen and expand the market in order to increase its consumption. Delhi, Bombay, Madras, Chandigarh, Kolkata and other cities are the big markets of mushroom in India. The quality of mushroom being exported is excellent as most of the big commercial farms grow hybrid strains of *A. bisporus*. Multinational companies like Sylvan, Amycel and others produce quality hybrid strain.

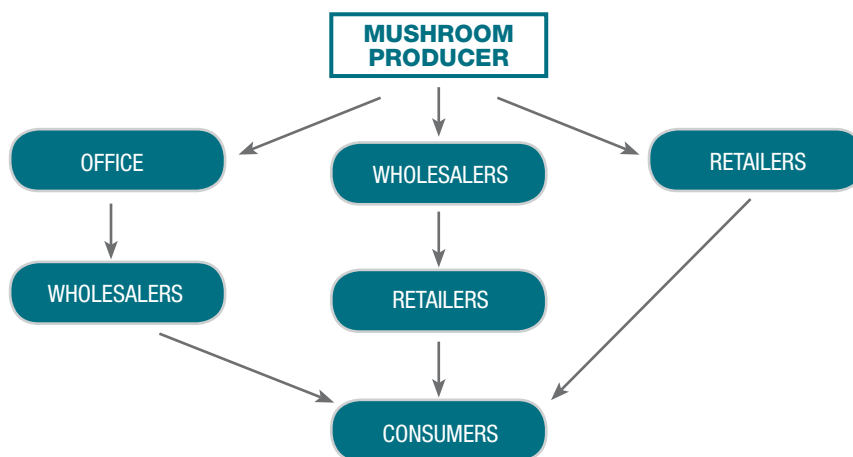
Mushroom is blanched and preserved with brine in large containers to ship at destinations and repacked at the final destination to supply in local markets. Freeze-dried mushroom is supposed to be good and exported at a good price. Mushrooms for freeze drying require to be picked as smaller buttons, compromising yield. India being a tropical country, fresh marketing remains at a premium, except for a short winter period. The commonly used packaging material is the polythene bag. Most of the mushrooms sold in fresh markets are treated with potassium metabisulphite to meet the demand of extra white mushroom and to remove adhered casing material. Large numbers of commercial units involved in the production of button mushrooms have been established by the entrepreneurs/farmers. Scientists have come up with the technologies, which have vast potential in mushroom production for nutritional and economic security.

The mushroom farm should be situated within the easy access of markets, compost suppliers and labour sources. Mushrooms require a good deal of capital outlay to enhance production efficiency as per the need of the market. The cultivation of white button mushrooms throughout the year under controlled condition is restricted to few commercial units and 30-40% of the production is being done under natural conditions during the winters. All the problems of marketing is experienced in 2- 3 winter months (Dec-Feb) when more than 75% of the annual production comes in market for sale in limited duration and market area. There is not much problem in the sale of fresh *Pleurotus* due to very low production. But there have been problems in selling dried 'Dhingri' particularly in exports, where middlemen take lion's share. Generally, the export orders are too big to be met by a single grower. *Pleurotus* growers may form a cooperative where they may pool their product and trade. Paddy straw mushroom (*Volvariella volvacea*) is another mushroom dominating whole part of Odisha and available in every nook and corner of the state.

## MARKETING

Harvested mushrooms need to be carefully handled and should be kept in a container that allows air circulation. It also needs proper care to prevent it from staining. The baskets containing mushrooms should be covered to keep flies out and protect from sunlight, high temperature and droughts. Harvested mushrooms either should be taken to market without delay in order to maintain their freshness and quality, or stored in a refrigerated environment or processed for value addition. The physical appearance of fruiting bodies is obviously important and customer preferences must be noticed to meet their demand. Some species discolor, if the gills or cap are damaged, and they must be handled with care right from harvesting to marketing. Marketing is all about getting the right product at the right price at the right time and in the right way. Fresh mushrooms

## MARKETING CHANNELS OF MUSHROOM BUSINESS



can be stored in the refrigerator, but only for 3-10 days (depending on the species and moisture content). Storage for long duration, mushroom drying is better option. Mushroom contains 90 per cent water, so drying them is not only an excellent method but also decreases their size, which makes storage and transportation easier. In order to dry mushroom, there is need of air circulation and a warm spot. An effective method of drying mushroom is placing them on kitchen paper and directing a fan at the mushroom to provide a constant airflow at a temperature of 25-30°C where mushroom become cracker dry in a few days. In India, mushroom has become the choice ingredient of dishes for many people. Hence, there is an emerging scope in the production and marketing of mushroom. During the course of time, mushroom marketing has gained momentum and has attracted more people to adopt as a source of income generation. The retail price of fresh mushroom ranges from Rs. 80 to 150 per kg, depending upon the season, demand and supply. In summer months, the price goes higher due to the high cost of electricity engaged in cooling. Prices are lower in winter due to arrival of mushrooms into the market from seasonal growers. Prices of mushroom reach even Rs 180/ in the wedding season due to sudden and higher demand within short period. In India, marketing of fresh mushrooms

is not very much organized however, trade in the processed product (canned and dried) of mushroom is substantial and organized. For efficient marketing especially export, it is necessary to understand the global trade vis-à-vis the sources of supply, potential regions of demand and consumption patterns. Like other countries, where 10% of the total cost is earmarked for marketing, we have not given the similar thought to the mushroom marketing. Not much serious efforts have been made to promote the mushroom product, to strengthen and expand the market. Mushroom is a novel food item and it is chosen for its flavor, texture, nutritive value but many people are not aware of 'what is mushroom and if aware, they are still confused whether it is vegetable or non-vegetable?' The popularization of deliciousness, nutritive and medicinal value of mushroom by advertisements, literatures, posters and demonstration may be highly helpful to build awareness. The demand of processed and fast foods is surging day by day and mushroom hold much scope and potential. Mushrooms may be canned to meet the demand in the off-season and in non producing areas while product diversification is being tried. Research is being done to bring down the cost of production of mushrooms and processing to promote the sale/ export of canned mushrooms in order to compete in the international market. There is not much problem in the sale



of fresh *Pleurotus* due to very low production cost but there have been problems in selling dried 'Dhingri'. The chain of marketing is not very straight and therefore, there is no direct linking between the exported quantity and production by growers. Formation of cooperative societies and federations is advisable to make a continuous, direct and established market of mushroom. *Pleurotus* growers may form a cooperative where they may pool their product and trade together. Agriculture Processed Food Products Export Development Authority (APEDA), Central and State agencies are eager to help them once they are assured of sufficient consignment for export for 2-3 years by the society or federation. The study of obstacles in marketing of mushrooms may help to tackle and expand the market. Computer and mobile based retailing may play a vital role in efficient and profitable marketing of mushroom in urban area through entrepreneurship development.

## STRATEGIES FOR GOOD MARKETING OF MUSHROOM

As other agricultural commodities, mushroom also requires special and suitable strategies for efficient marketing and following are the few strategies suggested for mushroom cultivation:

- Assured and continuous supply throughout the year at reasonable price is key to good marketing of mushroom. For this, efforts should be made to diversify and cultivate different mushrooms throughout the year along with cultivating some of the important mushroom during off-season under controlled condition.
- Creation of effective cold storage facility, refrigerated transport facility and establishment of processing units.
- Lowering the cost of production and bringing down the sale price to boost the demand of mushroom and mushroom products.
- Attractive and secured pre-packing of mushroom for good eye appeal.
- Awareness among producers and retailers about proper handling,

storage, food value and recipes.

- Producers should come up to supermarkets, vegetable stores, restaurants, hotels, general store, mother dairy and retail counters for retail sale of mushroom.
- Initiative should be taken by the public sector, processing and export organizations for the good marketing of mushroom.
- In a limited area, (village or a cooperative) the crops should be time-scheduled to get a daily reasonably uniform production to avoid glut on a day to meet the commensurate demand.
- The increased (surplus) production should get translated into economic gain for mushroom producers. This is only possible when marketing is organized and demand is ensured.
- Market research should be done prior to mushroom cultivation and their marketing strategies planned accordingly.

## MAJOR MARKETING CHANNELS

The mushroom grower can sell directly to the consumers either at the farm gate, local markets or door to door. Mushroom may be moved from farm to consumer through various routes as following:

- 1) Producer to consumers (direct marketing)
- 2) Farmer to big stores, hotels to consumers
- 3) Farmer to local market (retailers) to consumer
- 4) Farmer to wholesaler to local market (retailers) to consumer
- 5) Farmers to distributor to consumer.

## POLICY IMPLICATIONS

The market for mushroom and mushroom products continue to grow due to interest in culinary, nutritional, and health benefits. Mushroom markets are various based on varieties, types of mushroom products such as fresh product, processed product, dried product, frozen product, pickled mushrooms, mushroom powder, and mushroom sauces. Mushroom cultivation may prove a profitable

business venture if producer/farmer follow minimum cost approach, proper production management and suitable marketing strategies in their planning. Producers must be considered in various important aspects of scientific mushroom production like pest control, disease management, timely harvesting, method of picking, produce handling, storage and marketing channels used to sell the mushroom. Maintenance of hygienic condition play very important role in keeping pest and disease off. Occurrence of diseases and infestation of pests in mushroom cultivation takes place due to high humidity and warm temperature, bad effects of chemical control, lack of well-equipped growing houses. Floors should be kept clean and wastes should not be dumped near mushroom houses because waste material attract mushroom flies. Mushroom cultivation not only provides nutritional security but also employment, business opportunities, income to poorer and contribution in economic as well as social development of the country. Fortunately small-scale mushroom cultivation does not require significant financial assets. Cash, savings and access to credit or grants are seldom essential to initiate small scale cultivation which enables to provide sufficient cash and nutritious source of food. The central and state governments, private organizations and banks are normally good sources of credit for establishing mushroom business. Cooperatives are often in a better position to offer credit to rural farmers than individuals or financial institutions. External funding can be used to provide more efficient or high technological processing equipment, facilitate information and exchange visits, and provide training to expand cultivation skills. Thus, scientific production, producer's training programme and suitable governmental policies may play an important role in promotion and development of mushroom industry in the country.

**Santosh Kumar & Deepak Kumar Patel, Bihar Agricultural University, Sabour, Bihar**

# INTERNATIONAL AGRICULTURE CONSULTING GROUP

## Indian initiative towards food and agriculture solutions

### Vision

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

### Mission

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



### Objectives

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



**T**urning deserts into green spaces was the story in fables and fairy tales. But the myth turned into reality in the barren deserts of UAE and Oman. The man behind this revolution was Mr. T V Vijayan, an Indian who arrived in Dubai in 1979 to work. He toiled in the Vegetable Markets in UAE as commission agent for 10 years. These years were learning experiences for him and he soon used this learnings to create a farm in the desert. Hailing from Mayyil in Kannur district of Kerala, Vijayan started his own farm in UAE and later extended it to Oman as well. Practising high tech farming in 950 acres of desert, Mr. Vijayan is a glowing example of determination and will. His farms in UAE today carts 30 tonnes of vegetables a day to the market.

Extending his green touch to India, he Initiated VRS - Dream Land Fresh Green Vegetable Farm Pvt Ltd in 2013. With a mission to make the largest indoor farming project in India, Vijayan has already initiated work in Mysore on sixty acres of land. Situated in Hanoor, in Karnataka state, High tech poly house vegetable cultivation is



practised in 40 acres of land. With an investment of Rs.40 Crores, Vijayan has already started reaping the benefits.

Most of the produce from this high tech farm rarely reaches the local market or any other market in the country. They are routed to the markets across the world. Specifically export oriented, the vegetables found in the farm are tomatoes of different varieties, capsicums of



different colours, cucumber, cherry tomato etc. Vijayan's forty years of experience in this trade has endowed with him the knowledge of how the global markets work. His crops in the VRS - Dream Land Fresh Green Vegetable Farm are exclusively raised for exports and hence uses the best of the technology with the least interference from crop protection chemicals. "25% organic and 75% safe to eat concept" is his Mantra. Minimum use of chemical pesticides is the core of his Quality Policy. For crop protection the farms rely on biological agents, and other Integrated Pest Management practices rather than the indiscriminate use of conventional pesticides. The pest management products that are used in the farms are tag folder, tag nok, tag nema & kloud whereas for disease management they rely on new molecules such as tag kare, tag life, tag monas etc. Entrusting his faith completely on automated high tech polyhouses, Vijayan drives home the point that future is that of technology intensive agriculture.

Raising 500 MT of produce from his farm in Hanoor, he has grander plans for India. With the intention of raising the largest indoor farming project in India, his plan is to have over 1500 acres of land with over 500 acres of greenhouse with state of the art cold chain facility and packaging unit. The operations are expected to provide job opportunities in India to over 3000 people. The project would utilize the highest quality of seeds imported from Netherlands to produce the best quality vegetables. Catering to the burgeoning domestic and International markets of high quality vegetables, his advisory team includes International Agro consultants from Jordan, France, UAE and India.

Initial trials have yielded exceptional results. Vijayan's home town in Kerala became his first venture in India. His high tech approach towards vegetable cultivation in 10 acres of land in



Mayyil, Kannur district has already won accolades. Government of Kerala honoured him the award for high tech farming in 2016. With a strong work force of 350 permanent labourers, his farm has received attention from every quarters.

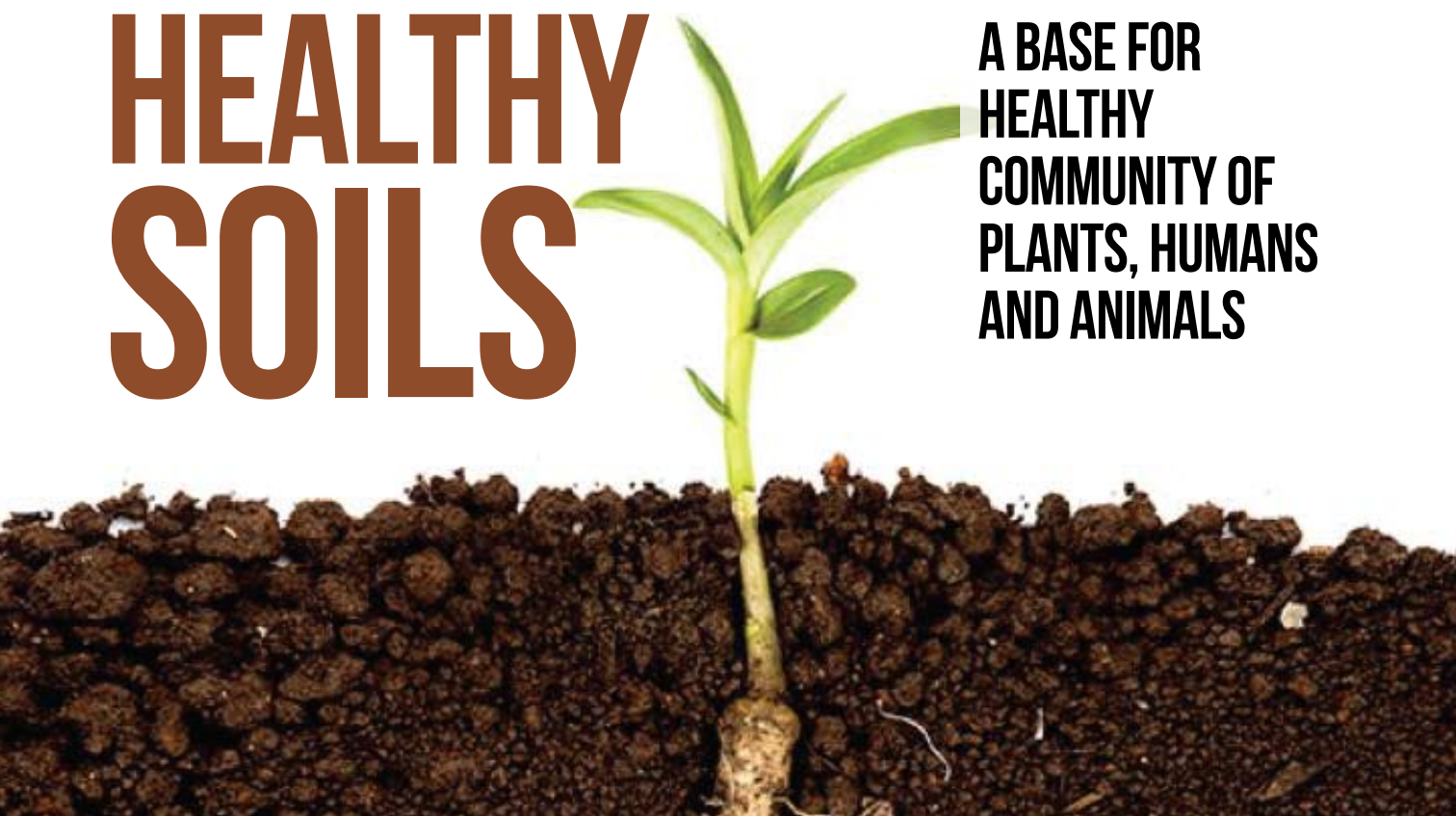
Vijayan is an example of how determination and conviction can achieve even the wildest of dreams. Horticulture has been widely recognized in India as

a preferable growth engine to enhance the country's agricultural production. However, India lags behind in technology adaption. Through adequate investments in the advanced technology, India can magnify its foot print in the world market and expand the share of foreign exchange in the agri segment. Vijayan exactly proves this point. India needs more farmers like him.



# HEALTHY SOILS

**A BASE FOR  
HEALTHY  
COMMUNITY OF  
PLANTS, HUMANS  
AND ANIMALS**



**P**lants truly are a miracle! To stay in one place and create food from sunlight not only for themselves but for a whole web of interconnected Life, in soils where the plant roots lively mingle with them and exchange food and resources with each other is none less than a miracle.

Consequences of such complex and natural phenomenon translates into food supplies for all living beings. Simplistic, but had it so been now as it was decades earlier many of our "modern ills" would not have come about.

Still agricultural soils weaken as they give up and share their immunity and nutrients with crops grown. Soil health, restored by natural processes, which continually build up soils, and repair them makes for organic growth.

Non application of pesticides, fungicides, fertilizers, weedicide etc., is not organic as is the perception, having gained ground.

Paramount importance is of soil



health, and for which, multitudes of soil bacteria, fungi and other organisms are imperative to make for good carbon content, through life process of living and decay, in addition to carbon which is absorbed from atmosphere. Carbon leaks ought to be plugged. Good fertile soil takes hundreds of years to form, but today's industrial and invasive agricultural practices ensure that such is lost.

To compensate for weaknesses in soils, turning to chemical intensive farming seemingly, becomes a necessity and which effects ricochet in known and unknown ways across generations. Such chemicals are absorbed by crops and move into food chains!

The economic, medical and social context arising there of cannot be wished away. Indeed a complex system is non linear, where a tweak at one place can have unimagined



effects elsewhere (importantly climate too).

Now one cannot overnight press the delete button and start fresh. The Prime Minister of India, Mr. Narendra Modi (reminiscent of Roosevelt soil health) has brought attention to the subject of soil health by suggesting that all farmers have soil health cards. The attention and intention have to be shared by the society, to empathize with the farmers in their predicament, to explore the resources required to change perception and way of farming rather than do all that the developed world has done and come back full circle to view soils as National wealth. No reason to repeat mistakes the developed world has made and, but, who now have resources and are attempting course correction. However their complexities, are less than that of India, I believe. What is sustainable for the farmer is not as assumed generally.

Receiving loans /subsidies for farm inputs, year after year, is unsustainable for the small or mid size farmer. The repayments that

they will be called upon to make to various agencies along with expenses on their family, education and such does not make farming sustainable, leave alone remunerative. Possibly, this keeps younger people, with increased aspirations, from entering farm sector, as also the lure of cities and jobs without the inherent risks of farming.

The Agri Business constituents could alleviate concerns to some extent, and perhaps imagine diverting a fraction of their energies to small but many farmers, partnering dedicated Agricultural Universities, with other Institutions and NGO's on the lines of natural agriculture, even if seemingly contradictory to their business model.(maybe explore a different business model !) With such handholding model surely they too would climb the learning graph and gradually see small albeit regular profit. We have innumerable small farmers who need to be reached out to. Truly they can learn to be sustainable and their produce which would be denser and nutritious earn them a little more and they at the

same time not be in perpetual loan repayment mode to someone or the other. Here the benefits will be more if the consumers have a way of evaluating the produce they buy. As of now the consumer is handicapped and good farmers are losers.

The idea of a BRIX read here comes helpful. Most crops and fruits in developed world are so evaluated and priced. Higher energy / sugar levels which plants do take up from living soils to have themselves immune from pests and disease, is in turn taken up by humans and animals for more nutrition and immunity. (consider lot of antibiotics developed from soil organisms !)

It is like joining the dots really..... to try see what we cannot, and not believe what we see is all there is ! Look at the picture we are via plants consuming the Sun's energy!

**Ashok Trivedi,**  
**Tea Farmer**  
**boisahabi@hotmail.com**







# SIDDARAMAIAH

## KARNATAKA'S INIMITABLE LEADER

**Siddaramaiah, leader of the downtrodden with a big support-base among the Kuruba community in Karnataka, rose to great heights within a short span of his political career. A headstrong personality even during his childhood days, Siddaramaiah did what he wanted to do. His strong will played a significant part in his political career. Rough around the edges, Siddaramaiah's outspoken character may have landed in him some controversies, but his iron will has braved all political instabilities. Defying the rough weather in the state politics, today he has assumed the top most position in Karnataka.**

**K** Siddaramaiah, the 22nd Chief Minister of Karnataka, was sworn into the top position of the state in 2013. Presently, a leader of the Indian National Congress party, Siddaramaiah was a member of various Janata Parivar factions for several years. Earlier, as a Janata Dal (Secular) leader, he was Deputy Chief Minister of Karnataka on two occasions.

Born on August 12, 1948 in a farming family to Siddarama Gowda and Boramma in a remote village called Siddaramanahundi in Varuna Hobli near to T. Narasipura of Mysore District, Siddaramaiah was second amongst five siblings. A reluctant learner, he did not receive formal schooling until he was ten. On his father's insistence, young Siddaramaiah was enrolled in the school. Later on, he graduated and also earned the Bachelor of Law degree from Mysore University. He was the first graduate in his village and also the first law graduate. While practicing under the lawyer, Chikkaboraiah in Mysore, he was attracted towards politics.

He made his assembly debut from Chamundeshwari on a Lok Dal ticket in 1983. He joined the ruling Janata Party and became the first president of the Kannada Surveillance Committee (Kannada Kavalu Samiti), set up to supervise the implementation of Kannada as an official language. During the mid-term polls in 1985, Siddaramaiah was re-elected from the same constituency and became Minister for Animal Husbandry and Veterinary Services. In Chief Minister Ramakrishna Hegde's government, he handled diverse portfolios such as Sericulture, Animal Husbandry and Transport at different stages.

After tasting defeat in the 1989 Assembly elections, he was appointed as Secretary General of Janata Dal in 1992, which H. D. Deve Gowda had also joined. He was elected again in the 1994 State Elections and became the Minister for Finance in the Janata Dal government headed by Deve Gowda. He was made Deputy Chief Minister when J. H. Patel became Chief Minister in 1996. After the split in the Janata Dal, he joined the Janata Dal (Secular) faction of Deve Gowda and became

the president of its state unit. In 2004, when the Indian National Congress and JDS formed a coalition government with Dharam Singh as Chief Minister, he was again appointed as Deputy Chief Minister. When differences cropped up with H. D. Deve Gowda, Siddaramaiah's association with the JD (S) ceased, and he joined the Congress. He won the Chamundeshwari bypolls held in December 2006, despite a fierce campaign against him. In the 2008 state Assembly elections, he contested from Varuna Constituency and was re-elected for the fifth time. He won the 2013 election from the same constituency and was elected as the leader of the Congress legislative party in the Karnataka assembly and subsequently elected as Chief Minister of Karnataka.

Siddaramaiah understands the significance of farmers in the economy of the state and had once quoted "Empowering farmers is Empowering Karnataka". Karnataka, which was facing its second successive drought year in 2016-17, received a shot of relief when the Chief Minister decided to waive off loans worth Rs. 8,165 crores, benefitting 2,227,506 farmers across the state. Hailing

from a farming community, he understands the problems of the farming population. He also believes that it is the responsibility of the government to address the problems of the farmers. "The agriculture profit is determined by right price for the produce, quality seeds and suitable environment. Today, the seeds supplied to farmers are substandard, there is no profit for the crops produced and climate change has consistently affected fodder crops. This is the reason many farmers are giving up agriculture. It becomes the government's responsibility to make agriculture profitable," said the Chief Minister. Karnataka under his leadership abolished agriculture income tax benefitting coffee, tea and rubber and other plantation crop growers.

A fearless leader and a socially committed individual, Siddaramaiah fought his wars like a warrior. His visionary leadership has rightfully placed Karnataka in its journey towards holistic development.

**Karnataka, which was facing its second successive drought year in 2016-17, received a shot of relief when the Chief Minister decided to waive off loans worth Rs. 8,165 crores, benefitting 2,227,506 farmers across the state**



“Today, farmers buy at retail rate and sell (their produce) at wholesale rates. Can it be reversed?. If they buy (inputs) at wholesale rates and sell at retail price, then nobody can loot them, not even middlemen”

**NARENDRA MODI**  
Prime Minister



“India is the second largest producer of food, leader in milk, fruits & vegetables, cereals and marine. It has a huge potential with 127 agro climatic zones, and proximity to food importing nations. With a 1.3 billion population, and a retail sector that is set to treble by 2020, it offers a large

demand driven market. The Indian economy has global players from both India and abroad. The Govt of India is creating the right infrastructure, an enabling environment and an innovation culture to foster strategic partnerships. World Food India 2017 provides that platform for partnerships”

**HARSIMRAT KAUR BADAL**  
Minister of Food Processing Industries



“Farmers are not able to avail of the benefits of the policies and schemes. It is also the duty of the field level workers to ensure that these benefits reach the farming families”

**RADHA MOHAN SINGH**  
Union Agriculture Minister



“Organic farming will help increase the income of the farmers, make agriculture more innovative besides boosting the overall production of the country”

**PARSHOTTAM RUPALA**  
Minister of State for Agriculture and Farmers' Welfare

“There is an urgent need of investment to create the infrastructure for agriculture and to provide farmers the right price for produce. Governments have to make investments and create the right atmosphere to attract private investment”

**MANGALA RAI**  
Former Director-General, Indian Council of Agriculture Research (ICAR)